BUREAU OF HYGIENE AND TROPICAL DISEASES.

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AMOEBIASIS AND DYSENTERY.

AMOEBIASIS.

JOHNS (Foster M.). **Cultural Methods and Direct Microscopic Examination in the Diagnosis of Pathogenic Amebas.**—*Southern Med. Jl.* 1930. Mar. Vol. 23. No. 3. pp. 236–237. [7 refs.]

The author's findings give some indication of incidence of infection in Louisiana: of 614 individuals, 50 harboured *E. histolytica.*

Thus:—

199 private patients examined as routine—18 (9 per cent.) infected:

181 medical students—15 (8·3 per cent.) infected:

234 Charity Hospital out-patients—17 (7·26 per cent.) infected.

Non-pathogenic amoebae were encountered—*E. coli* 58 (9·4 per cent.); *E. nana* 4 (0·6 per cent.); *Iodamoeba williamsi* 6 (0·9 per cent.); *Valkampfia lobospinosa* 1.

The 614 specimens of faeces (from as many individuals) were examined culturally and by direct microscopy. Forty-nine positive diagnoses were made by direct microscopy and thirty-nine positive cultures were obtained. One positive culture was obtained with negative microscopic findings.

H. M. Hanschell.

MELENEY (Henry E.). **Community Surveys for *Endamoeba histolytica* and Other Intestinal Protozoa in Tennessee; First Report.**—*Jl. Parasit.* 1930. Mar. Vol. 16. No. 3. pp. 146–153. [6 refs.] [Dept. of Preventive Med. & Public Health, Vanderbilt Univ., & Tennessee State Dept. of Public Health, Nashville.]

In this Tennessee survey, unlike other surveys, the specimens came from persons living in their homes and not in abnormal environment

such as hospital, asylum, or army camp; and mostly from persons under 18 years of age in white rural communities or small towns.

TABLE I.

Incidence of Intestinal Protozoa in Tennessee.

Summary of Survey, July 1 to December 3, 1929.

Basis of one Examination.

Total number of specimens	4,987
Total positive for one or more protozoa	2,759
Per cent. positive for one or more protozoa	55·3

Parasite.	Number positive.	Per cent. positive.
Endamoeba histolytica	861	17·3
Endamoeba coli	1,578	31·7
Endolimax nana	489	9·8
Iodamoeba bütschlii	288	5·8
Chilomastix mesnili	191	3·8
Giardia lamblia	942	18·9

In five families in a backward rural section 23 out of 27 individuals were found to be carriers of *E. histolytica* and of the carriers 17 had a history of bloody diarrhoea. These families were characterized by low intelligence and bad personal sanitation; and evidence from their histories and stool examinations pointed to the mother—the chief food and child handler—as the probable source of spread of *E. histolytica.*

H. M. H.

DOUGHERTY (Mark S.). **Amebiasis in the Southern States.**—*Southern Med. Jl.* 1930. Mar. Vol. 23. No. 3. pp. 251–256. With 1 map in text. [11 refs.]

The author discusses the subject, and sums up that definite conclusions as to the incidence of amoebic infection are not warranted by this study—and he therefore draws none: but calls attention to 221 cases reported as having amoebiasis in this survey of the South for 1928.

H. M. H.

FAUST (Ernest Carroll). **The *Endamoeba coli* Index of *E. histolytica* in a Community.**—*Amer. Jl. Trop. Med.* 1930. Mar. Vol. 10. No. 2. pp. 137–142. [9 refs.] [Med. College, Tulane Univ., Louisiana.]

The author lays stress on the fact that the presence of any amoeba in the faeces is indicative of contamination—a fact often overlooked. He shows in this paper that the presence of *Entamoeba coli* and *Endo-*

limax nana are important epidemiologically and clinically. He discusses his tabulated data :—

Comparative incidence of *Endamoeba coli*, *E. histolytica* and *Endolimax nana* in representative groups (corrected to 6 examinations).

Area, Group and Source.	Number of cases.	Number of examinations.	*E. coli*	*E. histolytica.*	*E. nana.*
Peking (Chinese and Foreign), Faust, 1929	13,617	3	24·2	20·3	28·0
Peking (Chinese only), Kessel and Svensson, 1924	368	3	30·9	29·5	40·1
England (convalescent dysenterics), Matthews and Smith, 1919	2,355	6	29·3	13·0	16·6
England (invalided troops), Jepps, 1921	971	6	30·4	23·7	28·6
England (civilian cases), Dobell, 1921	3,146	?	36–54	7–10	9–13
Sweden (hospital cases), Svensson, 1928	611	1	24·7	3·4	18·7
Sweden (asylum cases), Svensson, 1928	1,244	1	85·7	21·4	49·1
Finland (out-patients), Svensson, 1928	159	1	61·5	20·0	36·2
United States miscellaneous groups, Boeck and Stiles, 1923	8,029	1·6	24·5	6·8	22·0
Returned United States overseas troops, Kofoid and Swezy, 1921	2,300	1	43·6	29·1	62·4
United States home service troops, Kofoid and Swezy, 1921	576	1	33·9	9·7	59·1
Minnesota ex-service men, Riley, 1929	ca. 500	3	16·1	1·9	22·0
Wise County, Virginia, Faust, this paper	460	1	55·5	45·4	56·4
New Orleans area, Faust, this paper	172	3	34·0	27·9	16·6

and deduces therefrom that since *E. coli* is present in many of the stools containing *E. histolytica*, the two increasing or decreasing together, the finding of either is an admission of consumption of faeces in some form by the host.

In brief, the presence of *E. coli* in an individual constitutes *prima facie* evidence of faeces consumption and as such is an index, not merely of potential, but of actual infection with *E. histolytica*.

H. M. H.

HEYD (Charles Gordon) & SHEPLAR (Adele E.). **Amebic Dysentery : its Occurrence in Routine Surgical Practice.**—*Amer. Jl. Surgery.* 1930. Jan. New Ser. Vol. 8. No. 1. pp. 54–57. [Postgraduate Med. School & Hosp., New York.]

A report and discussion of seven cases of amoebic dysentery detected in the course of two years routine surgical practice. The cases were diagnosed by sigmoidoscopy and confirmed by cytological identification. The authors note that a considerable percentage of the population in

all geographical areas of the United States is probably infested with *Entamoeba histolytica*; the majority are relatively free from symptoms, but the supposed symptomless carriers frequently show conditions of impoverished health, or arthritis [*sic*!]. Removal of mucous plug through proctoscope from an ulcerated area had proved the most effective way of obtaining the vegetative amoebae.

H. M. H.

CLAASSENS (J. D. M.). **Chronic Amoebic Dysentery.**—*Jl. Med. Assoc. South Africa.* 1930. May 10. Vol. 4. No. 9. pp. 257–260.

The author gives brief clinical accounts of 11 cases occurring in his practice in one year. He notes as features common to all the cases: (1) peculiar grey facial pallor; swarthy tint of eyelids and circumorbital skin; pinched features; prominent eyes; glazed dead white sclerotics. (2) Intermittent diarrhoea, or obstinate constipation; intermittent asthenia, hypochondria, neurasthenia. (3) Vague abdominal discomfort, neuritis, arthritis, subnormal temperature, fatigue. (4) Enlarged spleen; palpable colon especially on left side, anaemia; and evidence of depression of internal secretions (dry skin, grey hair, premature senility). (5) History of mucus in stools.

Eight of these cases were examined by sigmoidoscope and were found to have diagnostic lesions, in some slight and inconspicuous. The amoebic ulcers were small, round or oval, crateriform with congested margins and lay in an elevation of the mucosa giving a raised undermined appearance. They were empty or contained yellow-grey slough. They appeared to start in the hollows of the bowel wall, e.g., in the depression between valvulae conniventes and in bases of sacculi. Several small, flat, usually pigmented buttonhole scars were present. The intervening mucosa was healthy or comparatively so. In two cases the ulcers were extensive and had run together, but there were islands and bridges of apparently normal mucosa.

H. M. H.

CAMPBELL (William). **Human Amoebiasis: Pathological Aspects.**—*Jl. Med. Assoc. South Africa.* 1930. May 10. Vol. 4. No. 9. pp. 260–262. [6 refs.]

A general survey of the said aspects. The author does not accept BRUMPT's *Entamoeba dispar*, for he has found that *E. histolytica* virulent for one cat, is frequently not so for another. The action of emetine in curing amoebic dysentery is in no way understood.

The author with GERSHOLOWITZ has found, in an as yet limited number of experiments, that the antitryptic activity of blood may be definitely increased for four days following a single injection of emetine. They are investigating further the problem whether the curative action of emetine in amoebiasis may be related to its action in increasing antitrypsin.

H. M. H.

DELL'AQUILA (Tommaso). Sette portatori di "Entamoeba histolytica" su dieci componenti di una famiglia. [**Seven Carriers of** *Entamoeba histolytica* **in One Family.**]—*Policlinico.* Sez. Prat. 1930. July 7. Vol. 37. No. 27. pp. 981–983.

Further evidence that amoebic dysentery is endemic in the Province of Bologna. A man of 50 years presented himself at a dispensary complaining

of abdominal pain and diarrhoea, 4–5 actions daily. Faecal examination revealed *E. histolytica*, both vegetative and cystic. Six other members of the family of ten were found to be cyst-passers. The only symptoms in these was a looseness of the stools. All were treated by intramuscular injections of emetine hydrochloride and stovarsol by mouth, and are said to have been cured.

H. H. S.

MEDULLA (Candido). Episodio epidemico di amebiasi in Marmarica. (Nota epidemiologica.) [**A Small Epidemic of Intestinal Amoebiasis in Marmarica (Cyrenaica).**]—*Arch. Ital. Sci. Med. Colon.* 1930. Mar. 1. Vol. 11. No. 3. pp. 157–160. [11 refs.] English summary (6 lines) p. 161.

In the 2½ months, May to mid-July, 1929, the author observed 68 cases, all but eight being soldiers in the local garrison. Fifty-two had symptoms of acute dysentery, 8 subacute, 3 chronic, 3 with hepatitis, 1 with symptoms of appendicitis and 1 with noma as a complication. Examination of the faeces of 182 hospital patients revealed the Entamoeba in 72, and in 50 of these *Trichomonas intestinalis* also. The population of Marmarica is mainly nomadic and the outbreak was almost certainly due to some carrier.

H. H. S.

KHOURY (Joseph). A propos des déterminations extra intestinales de l'amibe dysentérique. [**Extra-intestinal Determinations of** *E. histolytica.*]—*Rev. Prat. Malad. des Pays Chauds.* 1930. Feb. Vol. 10. No. 2. pp. 78, 81–82.

The author repeats the conclusions drawn from his large first-hand experience, in Alexandria, of critical examination of urine and sputa from many patients suffering from amoebic dysentery, and not so suffering. Not a few of these had been diagnosed as cases of amoebic bronchitis, amoebic cystitis, amoebic nephritis and the appropriate excretions declared to contain *E. histolytica.* In none could the author find *E. histolytica.* He, rightly, demands parasitological proof ; protests against the " proof " by clinical effect of emetine therapy ; and incidentally warns of the dangers of administration of emetine *larga manu.* [Dr. Khoury's valuable observations on this important matter have already received full notice in this *Bulletin.*]

H. M. H.

BERNARD (Etienne). Notions récentes sur l'amibiase pulmonaire. [**Pulmonary Amoebiasis.**]—*Arch. Méd. Chirurg. de l'Appareil Respiratoire.* 1929. Vol. 4. No. 3. pp. 257–266.

This paper though labelled " Revue critique " is in fact entirely uncritical. The only touchstone which can give the distinction " *amoebic* " to primary pulmonary " *amoebiasis* " is not the action of emetine on the lesion and symptoms, but *parasitological proof* that the lesion contained *amoebae* : and this is still to seek among all the " notions récentes " on " primary pulmonary amoebiasis."

H. M. H.

TADDIA (Leo). Bronchite amebica. Primi casi nella Marmarica Orientale (Cirenaica). [**Amoebic Bronchitis.**]—*Arch. Ital. Sci. Med. Colon.* 1930. May 1. Vol. 11. No. 5. pp. 264–270. English summary (4 lines) p. 271. [Inst. of Colonial Path., Univ., Bologna.]

Two cases are described,—the first from Marmarica (Cyrenaica). Both patients suffered from troublesome cough with viscid, mucopurulent expectoration streaked with blood. Tubercle bacilli were not found, but large motile amoebae with engulfed red cells were present. Cysts of *E. histolytica* were seen in the faeces of the second patient only. Treatment by 2 cgm. emetine intramuscularly daily for 10 days brought great improvement; after a second course the cure was complete. [The question of the cells being amoebae is not left in doubt by the author. His words (translated) are: "Microscopical examination of fresh specimens of expectoration showed numerous large amoebae three times the size of a leucocyte, varied in shape, with eccentric nucleus, and protoplasm containing red corpuscles."]

H. H. S.

PETZETAKIS (M.). A propos de l'amygdalite amibienne. [**Amoebic Tonsillitis.**]—*Rev. Méd. et Hyg. Trop.* 1930. Mar.–Apr. Vol. 22. No. 2. pp. 79–82. With 1 text fig.

The author repeats the words in which (1925) he recorded his observation in Egypt of acute tonsillitis in infants who developed, soon after the tonsillitis, a dysentery diagnosed amoebic as result of microscopical inspection of unstained stool specimens; and how the tonsillitis disappeared rapidly after emetine injections given for the dysentery: and the failure to demonstrate amoebae in or from the tonsils; and [nevertheless] his conviction that the tonsillitis was amoebic; and, indeed, that the tonsils were a frequent portal of entry for dysentery amoebae, and especially so in infants. He now states he has observed, and that most carefully, many such cases since then; and in this paper records just one other exactly such infant case, its "cure" by emetine injections, and again his said conviction.

H. M. H.

SAAD (B.) Contribution au diagnostic de la dysenterie amibienne par raclage des ulcérations recto-sigmoidiennes. [**Diagnosis of Amoebic Dysentery by Scraping the Recto-Sigmoid Mucosa.**]—*Presse Méd.* 1930. June 4. Vol. 38. No. 45. pp. 763–764.

Reports of clinical cases are given in support of the author's reasoned plea for rectoscopy and microscopical examination of scrapings from the lesions in rectum and sigmoid as the necessary and only sure means of establishing a diagnosis of amoebic dysentery. He, however, approves the dictum that in amoebiasis the localization is above all rectal [and is thus unaware, presumably, of the not few carefully observed cases where amoebic localization was only above sigmoid and rectum.]

H. M. H.

LEE (Y. S.). **Amoebic Liver Abscess.**—Reprinted from *Proc. First Pan-Pacific Surgical Conference, Honolulu, Hawaii. 1929. Aug. 14–24.* pp. 305–310. [3 refs.]

A very interesting survey of 40 cases, all Koreans, 1 female, 39 male (in LUDLOW'S 160 Korean cases, previously reported in 1926, see this *Bulletin*, Vol. 24, p. 355, 18 females, 142 males).

H. M. H.

DE LANGIBAUDIÈRE (Biaille) & THAN-TRONG-PHUOC. Note sur l'évolution spontanée d'un abcès du foie. [**Spontaneous Evacuation of Liver Abscess.**]—*Bull. Soc. Méd.-Chirurg. Indochine.* 1929. July. Vol. 7. No. 7. pp. 355–358. With 2 text figs.

The authors report that in Indochina are frequently seen enormous liver abscesses ; yet spontaneous evacuation by the diaphragm-pleura-lung-bronchus route, is rare. Rarer still is spontaneous rupture into the peritoneum. They record here, the rarest case of all—spontaneous opening of the liver abscess through the chest wall.

H. M. H.

BROWN (Philip W.). **Amoebic Abscess of the Liver: Report of Four Cases in the North Temperate Zone.**—*Amer. Jl. Med. Sci.* 1930. Feb. Vol. 179. No. 2. pp. 264–269. [5 refs.]

This group of four cases presents some of the rarer phases of the management of amoebic abscess of liver.

Thus in Case IV there was no positive confirmation of diagnosis of amoebiasis by laboratory methods. The author claims that the history of diarrhoea justified emetine therapy, and that there would not have been so abrupt and spectacular a response had the symptoms been due to a pyogenic infection of the gall bladder or liver. In Case I, aspiration had to be repeated several times—even with emetine treatment the body could not absorb so large an accumulation of pus as was present. In Case III abscess of liver developed in spite of and during thorough antiamoebic dysentery treatment (emetine, yatren, treparsol). In Case II in spite of resection of rib and drainage, the liver abscess ruptured into bronchi. The patient, only just able to keep alive, recovered after treatment by emetine and treparsol.

H. M. H.

DELACROIX (M. J. R.). Amibiase et constipation. [**Amoebiasis and Constipation.**]—*Arch. Méd. et Pharm. Milit.* 1930. Apr. Vol. 92. No. 4. pp. 503–517.

In an interesting paper of careful clinical observations the author gives records of eight illustrative cases. In six of these after one or more attacks of dysentery and/or diarrhoea (dysentery amoebae found at first attack or later), constipation had followed very soon, or after a period of alternating diarrhoea and constipation lasting for months or years.

In two patients, resident in Corsica or Morocco, constipation had set in without any preceding dysentery or diarrhoea (dysentery amoeba cysts found in stools). The author remarks that the growing number of

autochthonous amoebic cases makes this latter group of constipation cases of particular interest. In all eight cases the author found distinct enlargement of the liver. In six (out of these eight cases) the constipation yielded to treatment by emetine and stovarsol.

The pathology of the condition is fully discussed and the author concludes that, according to the length of time the infection has lasted, the constipation is a result of the scarring produced by former amoebiasis; or a direct manifestation of still active amoebiasis, and in this latter case amenable to "specific" treatment.

H. M. H.

CORDIER (V.) & MORENAS (L.). Eosinophilie pleurale symptomatique d'un abcès hépatique amibien évacué par vomique. Constatation d'*Entamoeba dysenteriae* dans l'expectoration. [**Pleural Eosinophilia Symptomatic of Amoebic Hepatic Abscess.**]—*C.R. Soc. Biol.* 1930. May 16. Vol. 104. No. 16. p. 198.

The authors state that presence of eosinophile cells in the tissue around an amoebic lesion is a well known fact. They describe a case of liver abscess in which exploratory puncture of the pleural cavity gave serofibrinous fluid containing 8 per cent. eosinophiles, 43 per cent. lymphocytes, 32 per cent. polynuclears, 17 per cent. large mononuclears. The blood showed no eosiniophilia. The pus from abscess revealed *E. histolytica* (smears stained by iron-haematoxylin).

H. M. H.

DE LAVERGNE (V.), ABEL (E) & DEBENEDETTI (R.). Eosinophilie pleurale au cours d'un abcès amibien du poumon. [**Pleural Eosinophilia in Amoebic Abscess of the Lung.**]—*Bull. et Mém. Soc. Méd. Hôpit de Paris.* 1930. Apr. 14. Year 46. 3rd Ser. No. 13. pp. 593–599. With 1 text fig. [8 refs.]

A full clinical record is given. The eosinophilia in the pleural exudate was transitory. At the first aspiration there was 85 per cent. eosinophiles. At the second aspiration one week later eosinophiles had fallen to 10 per cent. and the normal lymphocytosis was present instead.

H. M. H.

MYNSSEN (G. E. H. Verspyck). **A Case of Recurrent Amoebic Dysentery, due to a Mechanical Cause.**—*Acta Leidensia* (*Scholae Med. Tropicae*). 1929. Vol. 4. pp. 191–195.

A man with recurrent attacks of dysentery, during which amoebae were demonstrated in stools. These attacks were accompanied by, or had been preceded by abdominal pains suggestive of appendicitis. In a non-dysentery period (when amoebic cysts however had been found in stools), symptoms of acute appendicitis supervened. An acutely inflamed appendix, on the point of perforation was removed. It contained a small and a large faecal stone. Scrapings of mucosa distal to the stone revealed amoebae as well as many leucocytes. The patient made rapid convalescence. No subsequent dysentery and repeated examinations did not reveal amoebae or cysts in stools.

The author suggests that in cases of recurrent amoebic dysentery difficult to cure, there is the possibility of the lumen of the appendix being shut off from the intestine and a focus of amoebae being cultivated in the back part of the appendix.

H. M. H.

NAUMANN (H. E.). Beitrag zur Behandlung des Leberabszesses bei Amöbendysenterie. [**Treatment of Amoebic Liver Abscess.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1930. June. Vol. 34. No. 6. pp. 300–302.

The author refers to the work of MÜHLENS, who has shown the superiority of Yatren 105 over emetine in the treatment of amoebic dysentery. In the Hamburg Institute tropical liver abscess had been successfully treated by emetine in combination with Yatren 105 : later, FISCHER, in that Institute, had been the first to treat successfully a case of tropical liver abscess by Yatren 105 alone.

During the author's one year's practice in Jérémie, Haiti, he has had to treat acute and chronic amoebic dysenteries and cases of obvious liver abscess. He recounts his first experience of three cases whose condition was that of extreme exhaustion, large tender swelling of liver, irregular pulse, failing heart, bloody stools containing pus and amoebae. Injections of emetine, combined with heart stimulants and infusions of glucose and saline failed to save them. They died of heart failure—and, the author suggests, a heart failure aggravated if not caused by the emetine. In another case, here recorded in some detail, emetine injections had not resolved the swelling and pain of the liver, nor the mucosanguineous diarrhoea. When seen by him there was pronounced irregularity and failure of heart. When he substituted Yatren 105 clysma and later Yatren pills *per os* for the emetine injections, there ensued rapid and steady improvement to apparently complete recovery.

After this experience he has entirely ceased using emetine. He has had 21 further cases of liver abscess—and cured all by treating with Yatren 105 pills. He is emphatic that these were liver abscess—unquestionable (einwandfrei) : and describes three of them in some detail. All were gravely ill and more or less exhausted and emaciated—jaundice, painful large swelling of liver, mucous stools in which were found blood, pus and amoebae, fever ; leucocytosis 30,000 to 40,000. Irregular failing heart. They were given (besides other therapy for cardiac failure) Yatren pills. All made good recoveries, physical signs and symptoms due to liver, heart and bowel condition all rapidly disappearing.

As result the author declares that to use emetine is both dangerous and unwarranted.

[Abscess of liver is proclaimed, but, in fact, on the evidence given can be suspected only. The author declares the Haitians' fear of operation, even of " puncture," yet records their submission to hypodermic puncture, e.g., for injection of emetine ; and, intravenously, of strophanthin ; and no more than that puncturing would demonstrate pus, if there, in a large liver swelling and prove the charge of abscess.]

H. M. H.

MENK (W.). Zur Behandlung der Amöbenruhr. [**Treatment of Amoebic Dysentery.**]—*Beihefte z. Arch. f. Schiffs- u. Trop.-Hyg.* 1929. Vol. 33. No. 3. pp. 200–210 (284–294). With 1 text fig.

After a general survey of the subject, epidemiological and clinical, which offers nothing new, the author reviews again his own experience with Yatren 105, and again emphasizes—quoting cases in support—its economical and therapeutical superiority over emetine and emetine-

bismuth therapy for all types of amoebic dysentery. The records of Dr. Menk's work on which this claim is based have all from time to time received due notice in this *Bulletin.* H. M. H.

MAJUMDAR (Akhil Ranjan). **The Use of a Standardised Preparation of the Total Alkaloids of Kurchi Bark in Amoebic Dysentery.**—*Indian Med. Gaz.* 1930. Feb. Vol. 65. No. 2. pp. 80–84. [4 refs.]

The author reports on a further series of 34 cases treated orally with a standardized preparation of kurchi bark—an alcoholic extract yielding 1 per cent. total alkaloids and not more than 0·25 per cent. tannin [*ante*, p. 388]. Daily dose 6 drachms to 1 ounce, containing 3 to 4 grains total alkaloids. Though even double this quantity is well tolerated, it was found that 3 to 4 grains daily sufficed, provided that not too much of it was evacuated in the stool. All 34 cases showed motile vegetative forms of *E. histolytica* in the stools before treatment.

	Cases.	Deaths.
1. Pure amoebic dysentery	23	5
2. Amoebic dysentery, complicated with bacillary dysentery (mostly Flexner bacillus infections) ...	9	4
3. Amoebic dysentery, complicated with pulmonary tuberculosis	2	2
Totals	34	11

Results are not as bad as they appear to be, for the patients were street beggars, extremely poor, devitalized to an extreme limit, and usually in advanced cachexia. If stools were more frequent than 10 in 24 hours, some binding medicine, e.g., creta, kaolin, bismuth carbonate, sometimes with tinct. opii, was given in order to secure retention of the kurchi preparation for a sufficiently long time. The stools of the recovered cases were free from amoebae. The author concludes that ACTON, KNOWLES and CHOPRA are to be congratulated on having established on a scientific basis the value of this time-honoured remedy for dysentery in India. Acute cases of intestinal amoebiasis should be treated by intramuscular injections of the total alkaloids of kurchi—grains 2 daily ; or orally 3 to 4 grains daily ; treatment continued for 7 to 10 days. Subacute or chronic cases may be treated orally with tablets of total kurchi alkaloids, 3 to 4 grains daily ; or (ACTON and CHOPRA) of kurchi bismuthous iodide 4 grains (2·6 gr. total alkaloids), twice daily, for ten days.

The author hopes that kurchi in standardized extract, and in a standardized preparation of the total alkaloids, may be incorporated in the British Pharmacopoeia. H. M. H.

BIGGAM (A. G.) & ARAFA (M. A.). **The Effect of Rivanol in the Treatment of Amoebic Dysentery.**—*Lancet.* 1930. June 21. pp. 1335–1339. [9 refs.]

A record of observations carefully and critically made, of great value, for extravagant claims have already been made for the efficacy of rivanol in amoebic dysentery. The authors have very fully set out their observations, careful clinical descriptions being given of their 13 cases, with results of repeated sigmoidoscopy and stool microscopical examinations. The best summary is their tabulated results.

Table showing Result of Treatment by Rivanol in Amoebic Dysentery.

No.	Amoebic ulcers seen by sigmoidoscope.	Entamoebae present in sigmoidoscopic scrape.	Entamoebae in stools (lab. or ward).	Treatment (rivanol in grammes).	Result of Treatment.
1	+	+	−	0·025 t.d.s. 17 days	Relapse after 2 months entamoebae + ulcer present.
2	+	+	+	0·025 ,, 1st week 0·05 ,, 2nd ,, 0·075 ,, 3rd ,,	After a week's rest entamoebae present in stools.
3	+	+	+, also trichomonas.	0·025 ,, 1st ,, 0·05 ,, 2nd ,, 0·075 ,, 3rd ,,	After a week's rest entamoebae +.
4	+	+	+, also Lamblia.	0·025 ,, 10 days	Stools showed entamoebae.
5	+	+	+	0·025 ,, 18 ,,	Stools still + for entamoebae.
6	Very small ulcer	+	+	0·025 ,, 10 ,,	Stools still + for entamoebae.
7	Small ulcer +	+	+	0·025 ,, enema 1 : 10,000 (1 week, then enema stopped) continued per os 0·025 t.d.s. for 12 days.	Stools + for entamoebae.
8	+	+	+	0·025 t.d.s. 1st week 0·05 ,, 2nd ,,	Entamoebae + and ulcers healed. Relapse 2 months later with large ulcers and many amoebae.
9	One small ulcer	+	+, also Lamblia.	0·025 ,, 20 days	Ulcer healed. No symptoms for 6½ months.
10	Normal membrane, only sticky mucus.	−	+	0·025 ,, 10 ,,	Negative entamoebae still negative 2½ months later.
11	Very small ulcer +	+	+, also Morgan.	0·025 ,, 9 ,,	Negative entamoebae still negative 2½ months later.
12	+	+	+	Enema 1 : 2,000, stopped after 1 week local irritation.	Local irritation compelled stoppage of treatment.
13	Punched out ulcers + diffuse inflammation	+	+, also Flexner.	Rivanol 0·025 t.d.s.; 9 days' wash 1 : 10,000 m.e. 9 days.	Same appearance of ulcers as on admission. Entamoebae still present.

Average duration of Symptoms and Signs after starting Rivanol Treatment.

	Blood.	Mucus.	Diarrhoea.	Tenesmus.
Days	3·3 ...	3·3 ...	5 ...	3

They conclude that rivanol in 1 : 2,000 solution per rectum is irritating to the gut mucosa. In 1 : 10,000 solution it is not lethal to the entamoebae. Administered orally even in doses as high as 0·075 gm. thrice daily, it has no toxic effect on patient nor marked lethal effect on the entamoebae.

Rivanol procures great relief from symptoms ; tenesmus, blood, mucus, diarrhoea disappear, usually to return shortly after stopping the rivanol.

They consider that the antispasmodic and antiseptic action of the drug may with advantage be utilized for the relief of colic and tenesmus, and for assisting in cleansing the bowel of some of the superadded infection in various dysenteric conditions where lower bowel symptoms are a marked feature of the disease.

H. M. H.

URCHS (O.). **The Treatment of Amoebic Dysentery with Acridin Dyes.**—*Far Eastern Assoc. Trop. Med. Trans. Seventh Congress, British India, 1927.* Vol. 3. pp. 512–516. With 1 chart. [2 refs.]

This paper reports observations by the author and by PETER (recorded elsewhere and noticed in this *Bulletin*, Vol. 26, p. 876) claming rivanol (ethoxydiamino-acridin-lactate) as an effective remedy for *E. histolytica* infections. Further, the isolated colon of the rat was poisoned with pilocarpin 10^{-6}. The simultaneous spastic contraction was released by papaverin 10^{-5}. Rivanol 10^{-5} served exactly the same use. It is therefore a powerful antispasmodic, releasing spastic contraction of colon, without the disadvantages of an alkaloid of opium.

H. M. H.

ZORATTI. Note sur le traitement de la dysenterie amibienne par l'aurémétine. [**Treatment of Amoebic Dysentery by Auremetine.**]—*Ann. Soc. Belge de Méd. Trop.* 1929. Dec. 31. Vol. 9. No. 4. pp. 425–428.

Four African natives with dysentery, *Entamoeba histolytica* found in stools : treated by auremetine and stovarsol by mouth ; emetine enemata and, after stools were free from amoebae, by bismuth subnitrate by mouth : after the method recommended by WILLMORE and MARTINDALE. Three were cured : one died before the stools became amoeba-free. He had received 0·75 gm. auremetine, 0·75 gm. stovarsol and two enemata of emetine.

H. M. H.

NUBERT (Gr.) & BRANISTEANU (D.). L'émétine comme traitement des suppurations pulmonaires non amibiennes. [**Emetine in Treatment of Non-Amoebic Abscess of Lung.**]—*Presse Méd.* 1930. Jan. 29. Vol. 38. No. 9. pp. 132–134. With 2 text figs. [16 refs.] [Therap. Clinic, Jassy, Rumania.]

Brief clinical records of six cases which demonstrate that treatment by hypodermic injections of emetine hydrochlor. was followed by

apparent cure of one case of non-amoebic abscess of lung with foetid bronchitis. It failed to cure another case of non-amoebic abscess of lung, but abolished the foetid bronchitis. In four other patients with foetid bronchitis the emetine injections procured rapid disappearance of the foetor, marked diminution of the bronchial secretion, and improvement in the general condition. [So much for the proof of amoebiasis by results of " specific " emetine therapy.]

H. M. H.

SAUTET (Jacques). Contribution à l'étude de la dysenterie amibienne expérimentale chez le chat. [**Experimental Amoebic Dysentery in the Cat.**]—*Rev. Méd. et Hyg. Trop.* 1930. Mar.–Apr. Vol. 22. No. 2. pp. 67–72. [3 refs.] [Parasit. Lab., Faculty of Med., Paris.]

The author reviews the subject, records some experiments of his own, and concludes therefrom that :—

Inoculation into kittens of amoebae from cultures is valueless, for sometimes cultures of *E. histolytica* definitely pathogenic for man fail to infect the cat. Amoebae recovered from cases of subacute or chronic or chronic dysentery seem to fail more often to infect the cat than those from a case of acute dysentery.

Dysentery amoebae inoculated into the kitten by the same experimenter with the same techinque can give positive or negative results. Very often the kittens die of diarrhoea of undetermined origin or of pulmonary lesions in nearly the same time as those that die of a typical dysentery. So that in practice the doctor who seeks for diagnostic certainty by inoculation of patients' faeces into the kitten may fail to gain that assurance. Moreover, besides the difficulty in interpreting experimental results, there is the not negligible difficulty for the laboratory of procuring kittens.

H. M. H.

DESCHIENS (R.) & KIPCHIDZÉ (N.). Culture d'*Entamoeba dysenteriae* sur un milieu à base de gélose de Musgrave. [**Culture of** *E. histolytica* **on a Musgrave's Agar Medium.**]—*C.R. Soc. Biol.* 1930. Jan. 31. Vol. 103. No. 4. pp. 226–228.

(1) *Solid portion* (5 cc. for a tube) : agar 20 gm. ; NaCl 5 ; beef extract, 2 to 5 ; aq. destill. 1,000 cc. Solidify in inclined tube ; pH about 7 ; must not be above 7.

(2) *Liquid portion* (5 cc. for a tube) : Ringer's solution, or saline 6 parts in 1,000, pH 7 to 7·6.

(3) To each tube add 0·02 gm. of powdered fish or powdered beef muscle (fragments 5 to 100μ), and 0·02 gm. rice starch. Powdered fish, beef, and rice starch must be sterilized first by dry heat 110° C. for 10 minutes.

On the medium made up from these three portions the authors have obtained successful cultures of *E. histolytica* ; *E. gingivalis* ; *E. coli* (poor growth) ; an amoeba from a monkey's mouth of *gingivalis* type ; and one from a monkey's gut of *dysenteriae* type.

H. M. H.

Bacillary Dysentery.

Pratt (Thos. A.) & Frew (Hugh W. O.). **A Clinical Account of an Outbreak in Glasgow of Bacillary Dysentery.**—*Glasgow Med. Jl.* 1930. Feb. Vol. 113. No. 2. pp. 82–83.

Thirty-six cases admitted to hospital during August, September, October, 1929. All occurred in same neighbourhood, many in same street; 16 cases were removed from the same tenement. There were 17 females, 19 males; greatest incidence in age group 1–10 years, the most frequent age group 1–6 years. Of 25 cases bacteriologically examined, 19 were positive for *Bact. dysenteriae* Flexner; of 6 primarily negative cases two were later found to be positive. One nurse in attendance developed dysentery, with marked prostration, headache, vomiting, abdominal pain and severe diarrhoea with blood and mucus in stools; but with no rise of temperature. Otherwise the cases were mild.

H. M. H.

Hay (Hilda R.). **Fatal Epidemic Enteritis due to** *B. dysenteriae* **Sonne.**—*Jl. Hygiene.* 1930. Apr. Vol. 30. No. 1. pp. 25–31. [9 refs.]

Description of an outbreak of dysentery, in Glasgow, in infants—of seven cases all died—proved bacteriologically to be due to Sonne's bacillus. In two cases the diarrhoea was choleraic. No non-lactose fermenting organisms were found in the milk supply, which was the same as that given to other infants elsewhere who did not develop dysentery. Examination of four batches of milk was negative.

There was a close resemblance between the Sonne dysentery as it affected the infants in this epidemic and as it affected the rabbits and guineapigs inoculated with the isolated organisms. The assumption made clinically that *Bact. dysenteriae* (Sonne) caused lesions in the small rather than the large intestine was corroborated by the animal experiments, the resemblance being most striking in animals which survive inoculation long enough to develop lobular pneumonia. The two strains isolated during the epidemic were apparently of high virulence, for relatively small doses were lethal to the animals used.

H. M. H.

Mansell (H. E.). **Four Cases of Sonne Dysentery.**—*Lancet.* 1930. May 31. p. 1181. [9 refs.]

Reference is made by the author to the relationship of *Bact. dysenteriae* Sonne with *Bact. coli anaerogenes* and with the dispar group. His own account is of an outbreak of dysentery in a children's ward (Westminster Hospital) in which the Kruse-Sonne bacillus was isolated. Four cases in all occurred and the cultural and serological tests were fully positive. The outbreak was sudden in onset, but the symptoms were mild in character.

W. F. Harvey.

FRASER (A. M.) & SMITH (J.). **Endemic Bacillary Dysentery in Aberdeen.**—*Quarterly Jl. Med.* 1930. Apr. Vol. 23. No. 91. pp. 245–259. [44 refs.]

The article provides a very useful discussion of the subject of Flexner and Sonne dysenteries from a statistical, clinical, therapeutic, bacteriological and epidemiological point of view. During the years 1919 to 1928 there are recorded 147 cases of Flexner, 147 of Sonne, 28 of clinical dysentery without bacteriological evidence of cause, and no cases of Shiga dysentery. Most of the cases, both of Flexner and Sonne dysentery, occur in the age period 0 to 5 years, but this is specially so for the Sonne cases, where 108 out of 147 cases were in this age group. Percentage death rates have been 8·1, 4·08 and 6·2 for Flexner, Sonne and all types of dysentery respectively. The clinical descriptions refer to cases of Flexner and Sonne dysentery as seen in hospital practice; these cases could not be easily distinguished from each other or from mild infections due to members of the Salmonella group except by bacteriological investigation. They were characteristically sudden in onset, with general and alimentary symptoms. Temperature was not as a rule high, and was in 46·5 per cent. of cases mainly normal. If the temperature was raised, however, it did not as a rule last for more than 48 hours. In certain atypical Flexner cases, with rapidly produced toxaemia, central nervous symptoms manifested themselves before the truly dysenteric symptoms and some of these patients arrived in hospital with the diagnosis meningitis. Under the heading bacteriological investigation the interesting facts are noted that for 57 cases of Flexner dysentery the bacilli had disappeared in 37 by the 1st week, in 5 by the 2nd week, in 12 by the 3rd week and in the remaining 3 by the 4th week. For Sonne dysentery the corresponding figures were 41 by the 1st week, 4 by the 2nd, 4 by the 3rd, 3 by the 4th, while 1 remained continuously positive for 7 months. In Aberdeen, the Flexner organism met with has been that known as the Z type with a few sporadic cases of W, X, and Y types and none of the V type. The disease was "mainly spread by direct contact with the infectious discharges of subacute cases and convalescent carriers."

W. F. Harvey.

SMITH (J.) & FRASER (A. M.). **Agglutination Reactions in Relation to Sonne Dysentery.**—*Jl. Hygiene.* 1930. June. Vol. 30. No. 2. pp. 216–220. [15 refs.] [City Hosp., Aberdeen.]

It was found that positive agglutination increased steadily from the onset of the disease to a maximum 14 days later, with titres varying from 1 in 50 up to 1 in 6,400. A control series was afforded by 9 individuals, whose sera had been tested before they were attacked with dysentery. In all of these but one agglutination was negative for a dilution of serum of 1 in 50. After the attack the titre became positive in all of them, and in the individual who originally had given an agglutination of 1 in 50 the titre reached 1 in 400. Another series of tests, made with 138 sera of individuals in hospital, but not suffering from dysentery, gave for dilutions 1 in 50, 100, 200, 400, 800, and 1,000, positive results in 16, 6, 8, 1, 1, and 1 cases respectively, while 105 were negative. These results demonstrate that in the majority of cases an attack of Sonne dysentery gives rise to the presence of specific agglutinins. The occurrence of agglutination in 33 out of 138 individuals in

hospital for other diseases than dysentery indicates that Sonne dysentery is widespread and probably not sufficiently severe to require medical attention.

W. F. Harvey.

STANLEY (L. L.), GARFINKLE (F. E.) & GODDARD (W. P.). **Prison Epidemic of Flexner's Dysentery.**—*Jl. Amer. Med. Assoc.* 1930. Mar. 22. Vol. 94. No. 12. pp. 857–860.

In a population of 4,226 prisoners in California, 946 were attacked by a severe diarrhoea. *Bact. dysenteriae* Flexner was shown to be the causative agent. All the inmates affected fed in the general mess. Flexner's bacillus was found to be viable after eleven days when placed on bread at room temperature. The usual course of the disease was from three to four days : no deaths. It was impossible to determine which of the various treatments was most efficacious : (*a*) castor oil and whey; (*b*) castor oil, whey and bismuth; (*c*) castor oil and bacteriophage ; or (*d*) bacteriophage alone. (Bacteriophage alone was given to 40 cases, and with castor oil to 40 other cases.)

H. M. H.

SICÉ (A.) & BOISSEAU (R.). Notes sur la dysenterie bacillaire en Afrique Equatoriale Française. Bacilles dysentériques. Bacilles pseudo-dysentériques. [**Bacillary Dysentery in French Equatorial Africa.**] —*Bull. Soc. Path. Exot.* 1930. Apr. 9. Vol. 23. No. 4. pp. 385–393 [12 refs.] [Pasteur Inst., Brazzaville.]

The authors show that bacillary dysentery is widespread and not infrequent. Clinically it presents no new features. Typical Shiga, Flexner, Hiss, Strong, strains of bacteria were isolated, and other strains which gave varied atypical cultural reactions. Shiga bacterium was isolated 34 times in 155 cases—21·9 per cent.

H. M. H.

MORIWAKI (George). **Fatal Intestinal Bleeding in Bacillary Dysentery. Report of a Case.**—*China Med. Jl.* 1930. Apr. Vol. 44. No. 4. pp. 376–378. With 1 text fig. [Government Hosp. for Infectious Diseases, Port Arthur.]

Continual intestinal haemorrhage. Death on 17th day of illness. No autopsy. Culture of mucous portion of sanguineous stool gave colonies of a bacillus identified by sugar reactions as belonging to Komagoma B. group of dysentery bacilli.

H. M. H.

DE LAVERGNE (V.), MELNOTTE (P.) & DEBENEDETTI (R.). Sur la séro-agglutination dans la dysenterie à bacille de Flexner. [**Serum Agglutination in Flexner Dysentery.**]—*C.R. Soc. Biol.* 1930. May 1. Vol. 103. No. 14. pp. 1251–1252.

The test was microscopic. Forty-four sera of definite Flexner dysentery cases, examined from the 7th day, showed agglutination of the following titres : 18 at 1 in 2,000, 17 at 1 in 1,000, 1 at 1 in 500, 4 at 1 in 300 and 1 at 1 in 200, with no coagglutination to the Shiga bacillus at 1 in 50. Other sera were examined at the same time—some of patients with diarrhoea only, others of individuals without any

symptoms. All of the first of these showed some degree of agglutination. Some of the symptomless individuals did show agglutination and the remainder nothing higher than 1 in 50. Healthy persons gave no agglutination above 1 in 50.

W. F. Harvey.

DE LAVERGNE (V.), MELNOTTE (P.) & DEBENEDETTI (R.). Valeur du séro-diagnostic dans la dysenterie bacillaire. [**Value of Serum Diagnosis in Dysentery.**]—*Ann. Inst. Pasteur.* 1930. June. Vol. 44. No. 6. pp. 697–710. [15 refs.]

The disappointing results of culture of dysentery bacilli from the stools, especially if the examination is carried out at a distance, are well known. It is therefore important to know how far serum diagnosis, which is not subject to the limitation of the time elapsing before arrival at the laboratory, is specific. The authors set out to test this point in a small epidemic of established Flexner dysentery and they recognized the facts that positive serum diagnosis is not attainable before the 5th to the 7th day of the disease and possibly in some specially severe cases not attainable at all. Their material consisted of the serums of cases of: (1) patients with clinical dysentery; (2) patients with diarrhoea which was not dysenteric in character; (3) patients belonging to the military unit attacked without evident intestinal affection; (4) patients who had had dysentery 4 months previously with agglutinins in the blood; (5) patients suffering from typhoid fever; and (6) healthy persons not belonging to the epidemic focus and who had recently received T.A.B. vaccine. The first three classes gave quite appreciably high titres of agglutination to the Flexner bacillus, many of which reached 1 in 1,000 to 2,000, without any correspondingly high titre for the Shiga bacillus. The fourth class had originally given high titres and still showed a very specific agglutination of 1 in 200. The remaining classes showed no specific agglutination. It is necessary in carrying out agglutination tests for dysentery to use well-chosen strains with highly specific agglutination characters, and to carry the dilution of the test serum out to its limiting values. If agglutination is positive to Flexner and not to Shiga there is no question that the dysentery is of Flexner type. If, however, it is positive to Shiga and at the same time positive in a somewhat higher degree to Flexner, the probability is in favour of a Shiga dysentery. The authors consider that titres of 1 in 50 for Shiga and 1 in 75 Flexner are specific. These low agglutinations are, however, not those of actual current disease, but are manifestations of disease which has occurred some months at least previously. A high titre is specifically diagnostic of dysentery.

W. F. Harvey.

GHOSH (H.). Nouvelle méthode pour l'identification du type de l'infection bacillaire dysentérique. [**New Method of Identification of Type of Dysentery Bacillus.**]—*C.R. Soc. Biol.* 1930. Jan. 18. Vol. 103. No. 2. pp. 55–57.

The author states that the only specific treatment for bacillary dysentery is serum therapy. It is known that Shiga antidysentery serum acts with vigorous specificity against Shiga-Kruse infections and is as sharply specific as diphtheria antitoxin in diphtheria. Flexner antidysentery serum has not the same exact specificity. The anti-

Shiga serum is both antitoxic and antimicrobic, while the anti-Flexner is antimicrobic only, and is always less specific than the former, probably because, while the Shiga-Kruse organisms contain a soluble toxin, the Flexner does not—or contains only very little of it. Thus, were it possible to identify rapidly the variety of dysentery bacterium present, a rapid specific effect could be obtained by the appropriate antiserum in the usually very toxic and often fatal Shiga infections. Hitherto a wait of 72 hours is imposed before result of culture of faeces can be known.

The author found that *in vitro* a mixture of autolysed filtrate of Shiga-Kruse bacterium and of its antiserum (from animal immunized with autolysed Shiga-Kruse bacterium) gave flocculation, while mixture of autolysed filtrate of Flexner bacterium, or of Salmonella group, with corresponding antiserum gave none. Following up this observation, he thought it likely that the stools of patients suffering from acute Shiga-Kruse infections would contain autolysed toxin which would give flocculation with Shiga-Kruse antidysentery serum. And this has proved to be the case.

Technique.—Use faeces obtained as soon as possible after onset of illness. To 20 cc. of faeces add 0·5 per cent. $CHCl_3$; mix well; and incubate for 30 minutes. Filter through fine muslin, then through Pasteur-Chamberland bougie L2 under light pressure. To get a filtrate quickly a little physiological saline solution may be added. Take 4 cc. of the filtrate: in each of two tubes place 1 cc. of the filtrate and 0·2 cc. of anti-Shiga serum. Add to control tube one drop of 1 in 5 commercial formaldehyde. Incubate both tubes in water bath for one hour. A positive reaction is shown by appearance of fine flocculi, distinctly seen by lens. The control is quite clear. If the serum contain precipitate it must be cleared by centrifugation.

By this technique the author has examined 22 dysentery cases—6 Shiga, 14 Flexner, 2 Gaertner. Flocculation appeared in the 6 Shiga cases; none in the 16 other cases. Flexner and Gaertner serums were tried; they produced only a slight opacity but no flocculation, even after 6 hours' incubation in a water bath. No flocculation could be obtained with the faeces of the Shiga cases four to five days after onset of illness.

H. M. H.

PACHECO (Genesio). Resultado do emprego de um methodo para diagnosticar a dysenteria bacillar em 24 horas. **Results of the Use of a Method for the Diagnosis of Bacillar Dysentery in 24 Hours.**—*Archivos de Hyg.* Rio de Janeiro. 1930. Jan. Vol. 4. No. 1. pp. 115–121. English summary. [National Dept. of Public Health, Rio de Janeiro.]

The tests applied were: motility, Gram staining, sugar fermentation, catalase test, and agglutination with a serum dilution of over 1 in 500. The method gave an exact correspondence 18 times out of 49 with stools which were positive for bacillary dysentery by the longer and usual method.

W. F. Harvey.

SCHUBERT (Johann). Der Wandernährboden. I. Seine Anwendung auf die Typhus-Dysenteriediagnose. [**A Travel Medium. Its Application to the Diagnosis of Organisms of the Typho-dysentery Group.**]—*Zent. f. Bakt.* I. Abt. Orig. 1930. Mar. 4. Vol. 116. No. 1. pp. 18–22. With 5 text figs. [5 refs.] [General Hosp., Eppendorf.]

The article describes the preparation of a transparent medium made up with nutrient agar, gelatin, glucose and water blue as indicator; it has

a semi-fluid consistence to allow those organisms possessed of motility to travel downwards into the deeper layers. The degree of motility shown by individual organisms is the diagnostic feature used in differentiation and is gauged by the depth to which change of colour, turbidity and gas formation extend.

W. F. Harvey.

SARTORIUS (Fedie). Ergebnisse der bakteriologisch serologischen Ruhrforschung. [**Bacteriological and Serological Research in Dysentery.**]—*Monatsschrift f. Kinderheilk.* 1930. Apr. Vol. 46. No. 6. pp. 481–518. [262 refs.] [Children's Clinic, Univ., Münster.]

In this comprehensive review of the subject the author deals with the most important organisms which have established a title to causation in dysentery. The article is critical and informative with abundant reference to literature. It should prove very useful to any one wishing to pick up the threads of the controversy which still continues with regard to dysentery organisms. Briefly stated the contention is that most of these organisms, which are now referred to under different names find their original description under either the toxic species Shiga-Kruse or the non-toxic "pseudo-dysentery" types A to J of Kruse. The term pseudo-dysentery should, however, be abandoned for the better one of paradysentery. In a table the author sets out what he considers to be identical organisms: Shiga-Kruse with Aoki VIII; Kruse types A, D and H with the colitis bacteria of Braun, the Flexner group of Andrews, the Aoki groups I, II and V, and the paradysentery of Castellani (probably); Kruse type E with Sonne III, *Bact. dispar* of Andrews and the metadysentery organisms of Castellani (probably); Kruse type J with the Schmitz bacillus, *Bact. ambiguum* of Andrewes and paradysentery of Stutzer.

W. F. Harvey.

PACHECO (Genesio) & RODRIGUES (Celso). Sur la classification des bacilles dysentériques. [**Classification of Bacilli of Dysentery.**]—*C.R. Soc. Biol.* 1930. May 1. Vol. 103. No. 14. pp. 1324–1326. [3 refs.]

The study refers especially to the mannite fermenters. According to the authors the apparent variability of strains of this group is due to the development of latent characters during a long period of cultivation. These characters become definite and do not disappear again when they have manifested themselves after two years of laboratory subculture. The classification drawn out—into the types Shiga, Schmitz, Saigon, Y Hiss and Russell, Flexner and E-Kruse—is based on carbohydrate and serum reactions.

W. F. Harvey.

BOJLÉN (Knud). Types épidémiologiques des bacilles dysentériques au Danemark. [**Epidemiological Types of Danish Dysentery Bacilli.**]—*C.R. Soc. Biol.* 1930. Feb. 28. Vol. 103. No. 8. pp. 613–615.

Out of 732 cases of dysentery 537 were due to bacilli of Kruse E-Sonne type, 193 of Flexner type and only 2 of Shiga-Kruse type, The bacilli

of Kruse E-Sonne type can be subdivided into 4 classes according as they ferment or do not ferment xylose and maltose. The first subdivision of Flexner bacilli was into two large groups according to their action or want of action on saccharose. The further subdivision was made with reference to fermentation of sorbite and arabinose and the indole reaction.

W. F. Harvey.

BRAUN (H.) & BAAKE (Fr.). Zur Biologie des Ruhrbazillus Kruse-Sonne. [**Biology of the Kruse-Sonne Dysentery Bacillus.**]—*Zent. f. Bakt.* I. Abt. Orig. 1930. May 15. Vol. 116. No. 6/8. pp. 462–470. With 6 text figs. [10 refs.] [Municipal Hyg. Inst., Univ., Frankfurt a.M.]

Two types of colonies are formed by the Kruse-Sonne bacillus, one described as round with wavy margin and structure, the other as flat with a coarsely dentate margin. Development of bacteria capable of forming flat colonies can take place from round colony organisms but not *vice versa*. The experiments of the authors were devised to determine whether the development of "flat" bacteria from "round" bacteria could be facilitated by insufficient food material (hunger agar) or by the action of bacteriophage. Neither method could be shown to be effective. Of these two forms the bacterium of the flat colony is by far the more sensitive to the bactericidal action of sera and to the action of bacteriophage and yet in an individual suffering from Sonne dysentery agglutinins to both these forms are developed.

W. F. Harvey.

IACONO (Igino). I bacilli metadissenterici (ricerche sperimentali). [**Metadysentery Bacilli (Experimental Study).**]—*Il Morgagni.* 1930. Mar. 9. Vol. 72. No. 10. pp. 443–444, 447–456. [III Inst. of Clin. Med., Univ., Naples.]

This is an exposition of CASTELLANI's group of metadysentery bacilli which are differentiated from the true dysentery of Shiga and the paradysentery of Flexner and others by the fact that they ferment lactose as well as mannite and may, but slowly and not constantly, produce clotting of milk. The experimental work detailed consisted in carrying out the fermentative and serological reactions of the cultures obtained from the Ross Institute. No fresh ground is broken [see this *Bulletin*, Vol. 26 p. 155].

H. H. S.

MARTIN (C. de C.). **A Note on the Keeping Properties of Polyvalent Dysentery Bacteriophage.**—*Indian Jl. Med. Res.* 1930. Jan. Vol. 17. No. 3. pp. 945–948. [Central Research Inst., Kasauli.]

The bacteriophage was taken to England from Rangoon in November, 1927, brought back to Rangoon in December, 1928, stored in Calcutta from January to June, 1929, and sent up to Kasauli by goods train at a time when the temperatures in the plains may be 110° to 120° F. in the shade. It was tested for its bacteriolytic action, at the end of this period of 20 months, on strains of Shiga and Flexner organisms and found to have retained activity. There was no evidence in any of the capsules tested of the presence of an organism of the dysentery group.

W. F. Harvey.

SHIIBA (Y.) & MATSUOKA (K.). **Progress Report on Immunization per os against Typhoid and Dysentery.**—*Acta Med. in Keijo.* 1929. Vol. 12. No. 4. pp. 286–290. [Microbiol. Dept., Imperial Univ., Keijo.]

In the case of dysentery 24-hr. cultures were killed at 65° C. for one hour and the bacterial bodies dried. Two pills, each containing 0·003 gm. dried bacilli, were administered with water before breakfast for 5 consecutive days. Unpleasant symptoms were rare, amounting to slight diarrhoea or gastric pain in a few cases. Typhoid pills were similarly prepared, but contained 0·02 gm. dried organisms. It is still too early to draw any conclusions as to the results of administration.

W. F. Harvey.

WALKER (W.) & WATS (R. C.). **Dysentery Prophylaxis by Oral Bilivaccin at Poona and Secunderabad.**—*Jl. Roy. Army Med. Corps.* 1930. Mar. Vol. 54. No. 3. pp. 190–194. [2 refs.]

The trials made had reference to the use of "bilivaccin" by the mouth as prophylactic against bacillary dysentery and its effect upon the symptoms and course of the disease when contracted. A certain number of men in a few selected military units received the vaccine and the remainder served as controls. Instructions issued with the vaccine were carefully followed. Altogether 1,400 men received the vaccine out of a total of 5,080. The results showed no evidence of any prophylactic effect of oral bilivaccin and no modification of the disease when contracted.

W. F. Harvey.

FONTOYNONT & RAZAFINDRALAMBO. Quelques cas de dysenterie bacillaire dont un certainement à Shiga, à Tananarive. [**Bacillary Dysentery in Madagascar.**]—*Bull. Soc. Path. Exot.* 1930. Apr. 9. Vol. 23. No. 4. pp. 428–429.

HERIVAUX (A.). Note sur la dysenterie bacillaire à Tananarive.—*Ibid.* pp. 429–433. [Pasteur Inst., Antananarivo.]

Again confirm the fact that bacillary dysentery is not rare in Madagascar, and that there occur infections with Shiga bacterium.

H. M. H.

MIXED AND UNCLASSED DYSENTERY.

LITTLE (C. J. H.) & BORNSHIN (W.). **The Dysenteries of Mhow, Central India and the Central Provinces.**—*Indian Jl. Med. Res.* 1930. Apr. Vol. 17. No. 4. pp. 1015–1036. [5 refs.]

An interesting and valuable paper.

(1) Over 90 per cent. were bacillary; and 90 per cent. of these were due to *Bact. dysenteriae* Flexner. Less than 10 per cent. were caused by *E. histolytica.*

(2) Over 90 per cent. of positive cultures were obtained in bacillary dysentery, if stool were plated within thirty minutes of passage. If stool were more than 3 hours old only 40 per cent. gave positive cultures.

(3) In efficiently treated cases Flexner bacillus persisted much longer in the stools than did Shiga.

(4) Careful examination (results fully tabulated in this paper) of these cases showed that *fewer errors of diagnosis would be made if cases in which the mucus was acid were treated as amoebic dysentery and all others as bacillary* —a suitable [easy and quick] test for those who have not access to microscope or laboratory.

(5) " Green diarrhoea " in children was frequently caused by Flexner.

(6) Many amoebic dysenteries were probably cases of chronic amoebiasis lit up by infection with a dysentery bacillus.

(7) In infants Charcot-Leyden crystals did not indicate amoebic dysentery.

(8) Agglutinins produced during attack of Flexner dysentery were not specific to the type of infecting organism.

(9) Flexner W appeared to be predominant type in the area, but " percentage titre " method of typing did not always give correct classification.

(10) Emulsion of different types of Flexner in saline and glycerine, given as oral vaccine in total dosage of 180 million bacteria, gave satisfactory results in a very limited trial. Both it and similar emulsion of Shiga failed to produce agglutinins in experimental rabbits.

H. M. H.

PACHECO (Genesio) & DE MENDONÇA (F. Carneiro). Um anno de investigações nas dysenterias do Rio de Janeiro. **One Year Investigations on the Dysenteries of Rio de Janeiro.**—*Archivos de Hyg.* Rio de Janeiro. 1930. Jan. Vol. 4. No. 1. pp. 5–38. [17 refs.] English summary. [National Dept. of Public Health, Rio de Janeiro.]

In this investigation of stools of suspicious cases of dysentery, 385 were from the urban zone and 250 from the rural zone. The authors employed Teague's medium and sowed one fragment of mucus over 3 different points of the same plate in succession. Two or three plates of 15 cm. diameter were used to each case. As tests they used the cellular picture, the presence of mucus in the stool, sugar fermentations and serum reactions. All four tests are required, but the presence of mucus is a particularly useful presumptive sign in bacillary dysentery. The urban cases gave a percentage of 32·7 positive. Besides dysentery bacilli, amoebae were found in 14 cases and paratyphoid bacilli in 15 cases. Rural cases, where the dysenteric character of the stools was much less evident than among the urban cases, afforded only 12 per cent. of positive results.

W. F. Harvey.

KESSEL (John F.) & MASON (Verne R.). **Protozoan Infection of the Human Bowel. A Comparison of Laboratory and Clinical Observations.**—*Jl. Amer. Med. Assoc.* 1930. Jan. 4. Vol. 94. No. 1. pp. 1–5. [11 refs.]

The authors' summary and conclusions are :—

" 1. Patients in the Los Angeles County General Hospital, 60 per cent. of whom showed colitis symptoms gave an incidence of intestinal protozoan infection similar to that in cases examined by KOFOID in the California State Board of Health, and somewhat higher than that estimated by BOECK and STILES for hospitals throughout the United States.

" 2. Routine culture of stools in Ringer's egg-serum medium has not increased appreciably the percentage of *E. histolytica* infection over examinations made by the standard smear method, though both *Chilomastix* and *Trichomonas* have been noticeably increased.

TABLE V.

Frequency with which Cases are Associated with Diarrhoea, Chronic Colitis, Constipation, Gallbladder Disease and Duodenal Ulcer.

	Number of Cases.	Colitis with Diarrhoea or Dysentery.*		Chronic Colitis without Diarrhoea or Dysentery.		Diarrhoea and Colitis.†		Spastic Colitis.		Constipation.		Gallbladder disease.		Duodenal Ulcer.	
		Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
Negative for protozoa (4 to 6 examinations) ...	200	28	14	25	12·5	53	26·5	15	7·5	49	24·5	3	1·5	15	7.5
Harmless protozoa, *E. coli*, *E. nana*, *Councilmania*	200	15	7·5	28	14	43	22·5	17	8·5	45	22·5	8	4	6	3
E. histolytica	100	26	26	40	40	66	66	7	7	24	24	3	1·5	4	4
Giardia	50	12	24	10	20	22	44	1	2	12	24	2	4	3	6
Chilomastix	100	10	10	21	21	31	31	7	7	29	29	13	13	8	8
Trichomonas	50	8	16	9	18	17	34	3	6	10	20	3	6	8	16

* Exclusive of bacillary dysentery.

† Percentages in this column are higher than in table IV because they take into account diarrhoeaic and colitis symptoms that may be superimposed in cases presenting an otherwise adequate diagnosis.

"3. Routine bacteriologic culture of material from proctoscopic smears and fresh stools for *B. dysenteriae* and gram-positive cocci from cases found to be positive for intestinal protozoa, has shown that these bacteria are present in a low percentage of such cases and when present may have a bearing on the history. They are insufficiently numerous in Los Angeles, however, to obscure the clinical picture of protozoiasis in a high percentage of cases. *B. dysenteriae* has been found most commonly in *Giardia* infections among children.

"4. In a comparison of hospitals cases positive for intestinal protozoa with cases negative for intestinal protozoa the following general deductions may be drawn:

"(*a*) Patients harbouring *E. coli*, *E. nana* and *Councilmania lafleuri* do not exhibit gastro-intestinal symptoms more frequently than those negative for intestinal protozoa.

"(*b*) Patients harbouring *E. histolytica* exhibit colitis symptoms about three times as frequently as those negative for intestinal protozoa. This fact emphasizes the importance of routine examination for *E. histolytica* in patients who exhibit gastro-intestinal symptoms.

"(*c*) The group positive for flagellates (Giardia, Chilomastix and Trichomonas) is associated more frequently with gastro-intestinal symptoms than the groups negative for protozoa or positive for the commensal amoebas . . .

"(*d*) Twice as many children found to harbour *Giardia* exhibited gastro-intestinal symptoms as did the adults who harboured *Giardia*.

"(*e*) 'Spastic colitis' and constipation are not associated more commonly with the groups harbouring any intestinal protozoa than with those negative for intestinal protozoa.

"(*f*) Cases showing symptoms of gallbladder disease and duodenal ulcer show an increased incidence of *Chilomastix* and *Trichomonas* infection."

H. M. H.

MAGATH (Thomas B.) & BROWN (Philip W.). **A Study of the Symptom, Diarrhea. I. The Relation to Flagellate Infestation.**—*Amer. Jl. Trop. Med.* 1930. Mar. Vol. 10. No. 2. pp. 113–136. [18 refs.] [Mayo Clinic, Rochester, Minn.]

A valuable paper giving full details of a careful study of 60 patients infested with *Chilomastix mesnili* only; of 267 infested with *Giardia lamblia*; and of 420 control subjects in whom parasites were not found after at least three stool examinations. The authors' records indicate that *Chilomastix mesnili* is more common in the South Atlantic States than in other portions of the U.S.A. *Giardia lamblia* is general throughout the United States and is more common in children than in adults.

In each of the groups of cases studied, diarrhoea, either intermittent or steady, was of practically equal occurrence: and so was constipation and incidence of normal stools. Bloody diarrhoea is, perhaps, less common with *G. lamblia* than in the control cases.

Achlorhydria, although often found correlated with diarrhoea, did not in itself explain the diarrhoea; this was most often explainable by improper food or infection with bacteria or perhaps by some as yet unknown abnormal physiological state. Most of the patients were relieved by dieting and general hygienic measures. Scientific proof was lacking that intestinal flagellates caused diarrhoea.

H. M. H.

BUROWA (L. F.). Yatren in der Therapie der Colitiden. [**Yatren in the Treatment of Colitis.**]—*Arch. f. Schiffs- u. Trop. - Hyg.* 1929. Sept. Vol. 33. No. 9. pp. 467–472. [4 refs.] [Protistol. Clinic, Central Asiatic State Univ., Tashkent.]

Brief clinical accounts of illustrative cases are given. As result of his experience with 24 cases, viz. : 8 cases of amoebic dysentery ; 11 of ulcerative colitis ; 5 of constipation following ulcerative colitis, the author stresses the value of treatment by Yatren and emetine in combination, for which he claims 96 per cent. good results and 4 per cent. failures. [Imposing percentages and a small number of cases.]

H. M. H.

TAKEDA (T.). Sur l'échange intermédiaire anormal dans la dysenterie infantile. [**Abnormal Metabolism in Infantile Dysentery.**]—*Oriental Jl. Dis. Infants.* 1929. Nov. Vol. 6. No. 3. p. 35. [Pediat. Inst., Imperial Univ., Kyoto.]

In 79 cases of infantile dysentery the author made repeated examinations of the patients' urine. Acetonuria developed most often in the first 24 hours. It was in greatest quantity and lasted longer in the intestinal type of dysentery, than in the nerve or toxic type. Acetonuria was always most marked from the 2nd to the 5th day and then diminished, as was also the case with oxybutyric acid. These observations suggest some arrest of hepatic function due to the dysentery toxin.

H. M. H.

ZIA (Samuel H.). **Mixed Infection of Acute Dysentery and Typhoid Fever.**—*Nat. Med. Jl. China.* 1930. Feb. Vol. 16. No. 1. pp. 28–33. [8 refs.] [Union Med. College, Peking.]

The author gives a summary of 13 cases of mixed infection of acute dysentery and typhoid fever. In 10, specific organisms of dysentery were determined. The prognosis was fairly good.

H. M. H.

BANUELOS (Trinidad P.). Typhoid and Dysentery Survey for the Last Semester of 1928.—*Jl. Philippine Islands Med. Assoc.* 1929. Dec. Vol. 9. No. 12. pp. 440–442. [San Lazaro Hosp., Manila.]

DIMITRAKOFF (K.). Die Amöbenruhr in Bulgarien. Ein Fall subakuter Amöbenocclusion des Dickdarms.—*Arch. f. Schiffs- u. Trop.-Hyg.* 1930. Jan. Vol. 34. No. 1. pp. 54–58. With 2 text figs. [1 ref.] [Therap. Clinic, Univ., Sofia.]

ISHIKAWA (S.). Enterohemorrhage of Dysentery Patients and its Statistic Observation.—*Jl. Oriental Med.* 1930. Mar. Vol. 12. No. 3. [In Japanese. English summary p. 28.] [Manchuria Med. College, Mukden.]

MUNRO (Robert). Prophylaxis against Dysentery by Oral Vaccines. [Memoranda.]—*Brit. Med. Jl.* 1930. May 31. p. 1001.

SHEDROW (A.). Amoebic Abscess of the Liver cured by Medical Treatment.—*Jl. Med. Assoc. South Africa.* 1930. May 24. Vol. 4. No. 10. pp. 290–292.

SILVERMAN (Daniel N.). Bacillary Dysentery in Louisiana.—*New Orleans Med. & Surg. Jl.* 1930. May. Vol. 82. No. 11. pp. 782–783.

ZAFRA-CUAJUNCO (Dolores). Care of Children convalescing from Dysentery.—*Jl. Philippine Islands Med. Assoc.* 1929. Nov. Vol. 9. No. 11. pp. 407–409.

SLEEPING SICKNESS.

YORKE (Warrington), ADAMS (A. R. D.) & MURGATROYD (F.). **Studies in Chemotherapy. II. The Action *in Vitro* of Normal Human Serum on the Pathogenic Trypanosomes, and its Significance.**—*Ann. Trop. Med. & Parasit.* 1930. Apr. 7. Vol. 24. No. 1. pp. 115–163. [3 pages of refs.]

As a result of work published in 1929 [*ante*, p. 237] in which the authors describe their method of maintaining pathogenic trypanosomes alive *in vitro* at 37° for 24 hours, by use of serum from the rabbit and other animals, they were able to show for the first time that *in vitro* as well as *in vivo* human serum (and plasma) destroys *T. rhodesiense* and spares *T. gambiense*. This led them to the further enquiry into the meaning of these observations in the epidemiology of human trypanosomiasis, and to put forward an interesting hypothesis. Their conclusions are as follows :—

" 1. The interesting discovery made by Laveran, in 1902, that normal human serum, when injected into mice suffering from nagana, exerted a marked effect on the course of the infection, has called forth an enormous number of papers dealing with different aspects of the subject.

" 2. In the historical survey which we have given of this work, it is pointed out that when Laveran and Mesnil first discovered the fact that human serum had a definite therapeutic effect on mice infected with *T. brucei*, they were inclined to associate the phenomenon with man's immunity to this parasite. The facts, however, that Laveran and Mesnil and many others who followed them were unable to demonstrate that human serum had any action *in vitro*, and that Laveran and Mesnil had found that plasma was but slightly active as compared with serum, tended to shake confidence in the view ; and Rosenthal, who has spent many years investigating the subject has reached the definite conclusion that the therapeutic and protective property of human serum is in no way related to man's immunity to the pathogenic trypanosomes of animals. Rosenthal believes that human serum contains a trypanocidogenous substance which, on injection into an animal, is converted into an active trypanocidal substance by the reticulo-endothelium of that animal.

" 3. In contrast to the experience of previous workers, we have succeeded in showing that normal human serum—and, equally, normal human citrated plasma—exerts a pronounced trypanocidal action *in vitro* at 37° C., on a number of strains of pathogenic trypanosomes. With our laboratory strains of *T. equiperdum* and *T. rhodesiense*, the trypanocidal action of normal human serum could be demonstrated even when the serum was diluted 5,000 and 25,000 times respectively ; with two recently isolated strains of *T. congolense*, the trypanocidal action was obtained with serum diluted up to ten times ; with ' Sherifuri K ' strain—a recently isolated *rhodesiense*-like strain from a case of sleeping sickness in Northern Nigeria —the trypanocidal action was manifest with undiluted serum only ; but on our old laboratory strain of *T. gambiense*, normal human serum had no appreciable trypanocidal action.

" 4. The properties of the trypanocidal substance of normal human serum were studied, and a method described for determining its titre. In the course of this work the interesting fact was established that the sera of certain normal sheep and of certain normal rabbits possessed ' anti-trypanocidal ' properties, in that when they were mixed with normal human serum, they prevented the trypanocidal action of the latter. The sera of other sheep and rabbits did not possess this property.

" 5. In certain pathological conditions, e.g., amoebic abscess of the liver, and obstructive jaundice, the serum loses its trypanocidal power, and exerts no cytolytic action on the trypanosomes *in vitro*.

"6. The unequivocal demonstration that *T. rhodesiense*, *T. equiperdum* and *T. congolense* are rapidly destroyed *in vitro* at 37° C. by normal human serum or plasma, and that *T. gambiense* is apparently unharmed by either, endows the well-known phenomenon of the therapeutic action of human serum in experimentally infected mice with an entirely new significance, and appears to us to afford the strongest grounds for believing that man's immunity to infection with the pathogenic trypanosomes of stock, and his relative susceptibility to *T. gambiense*, are bound up with this property of his serum.

"7. Evidence is adduced that resistance to the cytolytic action of human serum is a 'fixed' character of *T. gambiense* which survives many years' passage through laboratory animals, but that the serum-resistance of *T. rhodesiense* is a 'labile' character which is relatively quickly acquired and quickly lost. How long a strain of *T. rhodesiense* remains resistant to normal human serum after its isolation from man is not yet known, but we have produced some evidence to show that it becomes to some extent serum-sensitive within a year, after passage through a series of only five laboratory animals.

"8. We believe that these facts have an important bearing on the epidemiology of human trypanosomiasis, and assist in clarifying the difficult and still vexed questions of the identity of *T. brucei* and *T. rhodesiense*, and the antelope reservoir of the latter parasite, and of the relationship of these parasites with *T. gambiense*.

"9. We have elaborated a hypothesis which, in our view, affords a reasonable explanation of the facts, so far accumulated, regarding the epidemiology of human trypanosomiasis in Africa. Briefly stated, the hypothesis is as follows:—*T. gambiense* is, like *T. rhodesiense*, identical with *T. brucei*, its apparent greater differences being merely due to more profound modification resulting from numerous passages through the human host. In other words, the source of both trypanosomes pathogenic to man —*T. gambiense* and *T. rhodesiense*—is *T. brucei*, of which the natural reservoir is the game. The game trypanosome is not pathogenic to normal man because of the protective trypanocidal action of his blood. Under certain conditions (pathological and dietetic) the trypanocidal substance disappears from the blood of man and he becomes susceptible to infection with the game trypanosome. If such an individual becomes infected he develops a *rhodesiense* infection. These infections are seen typically in *morsitans* regions where the chief food supply of the fly is game or stock; they are of sporadic occurrence and are unlikely to assume the form of considerable epidemics. We believe that *gambiense* infections likewise originated in this manner, but that having occurred in *palpalis* regions, where the contact between man and fly is more intimate than in *morsitans* regions, there was a correspondingly greater chance of man to man infection. Prolonged man-Glossina-man passage has produced the modifications of the parasite which have resulted in the characters of *T. gambiense*, the most striking of which is its 'fixed' resistance to the trypanocidal action of human serum. As it is only in Tropical Africa that this hypothesis can be put to the test of experimental enquiry we have, for the guidance of those working in the field, indicated the manner in which this enquiry could most profitably be conducted."

It is essential that all who are able to publish observations for or against this hypothesis should read the complete paper, but a few points are selected from the "discussion." The authors discuss the results of RAZGHA given in some detail, above, on page 244. RAZGHA cultivated trypanosomes pathogenic to man on a medium of equal parts of Ringer's solution and citrated human blood. He used three strains of *T. gambiense* and two of *rhodesiense* of various ages and obtained varying degrees of success. The authors explain his results in the

light of their own observations. Experiments of ZEISS and others are cited and the authors go on :—

" The resistance of *T. gambiense* to the cytolytic action of human serum thus appears to be a remarkably fixed character, and it is difficult to avoid the conclusion that man's susceptibility to infection by *T. gambiense* is directly due to this fact. When, however, we turn to *T. rhodesiense*, the problem is not so simple. Here we have to deal with a parasite which within two years of its isolation from man is very susceptible to the cytolytic action of human serum. It seems to us incredible that our laboratory strain of *T. rhodesiense* which, as we have shown is killed by normal human serum, or plasma, *in vitro* at 37° C. within a few hours, even though the serum or plasma is diluted to such an extent that its concentration in the medium is only 1 : 25,000, could infect man ; and we are, therefore, compelled to conclude that it has changed radically since its isolation from man, and that *T. rhodesiense*, unlike *T. gambiense*, rapidly loses its serum-resistance when maintained in laboratory animals. In other words, the serum-resistance of *T. rhodesiense* is not a fixed or stable character, but is one which is relatively readily acquired and quickly lost."

They discuss their " Sherifuri K " strain which in its serum resistance was intermediate between *T. gambiense* and *T. rhodesiense*. Though it was isolated from a native in Nigeria where all trypanosomiasis is of the *gambiense* type, sub-inoculated animals exhibited numerous posterior nuclear forms, the pathogenicity in guineapigs resembled that of *T. rhodesiense* strains and the authors understand that the adhesion test showed the parasite to be more closely related to the local strain of *T. brucei* than to that of *T. gambiense* ; moreover, *G. morsitans* occurs in the district and *T. brucei* in the game. These facts suggest that the " Sherifuri K " strain is *T. rhodesiense* [and, if this is so, incidentally extend the area of that species to West Africa].

The hypothesis is then set out in 8 paragraphs, thus :—

" 1. *T. rhodesiense* is synonymous with *T. brucei*, and the antelope and other game of Central Africa constitute, as was claimed by Kinghorn and Yorke, the reservoir.

" 2. Normal human beings cannot be infected with the parasite derived from game—either by blood injection or by the intermediary of Glossina—because of the remarkable trypanocidal power of human blood (plasma).

" 3. In individuals suffering from certain diseases, and probably also in those suffering from the effects of insufficient or improper dietary, the trypanocidal power of the blood is lost, and consequently such persons can be infected by Glossina which have drawn the virus from game.

" 4. When once the game trypanosome has established itself in an individual of this kind, it by degrees becomes serum-resistant—a process which is accelerated if, for any reason, the cause of the initial decrease or absence of trypanocidal substance is removed and the serum gradually recovers its lost power.

" 5. After it has sojourned in the human host for some time, the trypanosome is, like *T. gambiense*, definitely serum-fast, and consequently—unlike the parasite derived directly from game—infective for man.

" 6. The serum-fastness is possibly preserved during the passage of the parasite through Glossina ; and if so, the infection could spread from man to man through cyclically infected tsetse. If, however, this proves not to be the case, then the only obvious explanation of such localised epidemics of this form of the disease as have occurred, e.g., the Mwanza epidemic, is either that the fly transmits mechanically the serum-fast parasite from man to man, or that some local condition exists, e.g., dietary deficiency, or hookworm disease, which so affects the population as to deprive many individuals of the protection due to the trypanocidal power of the blood.

" 7. If the parasite is passed on by tsetse to game or domestic animals instead of to man, it quickly loses its serum resistance—how quickly we do

not yet know, but the available evidence suggests that the period is between one and two years—and so again becomes incapable of infecting normal man.

"8. *T. gambiense* is, like *T. rhodesiense*, identical with *T. brucei*, its apparent greater differences being merely due to more profound modification resulting from numerous passages through the human host. In other words, the source of both trypanosomes pathogenic to man—*T. gambiense* and *T. rhodesiense*—is *T. brucei*, of which the natural reservoir is the game. The game trypanosome is not pathogenic to normal man because of the protective trypanocidal action of his blood. Under certain conditions (pathological and dietetic) the trypanocidal substance disappears from the blood of man and he becomes susceptible to infection with the game trypanosome. If such an individual becomes infected he develops a *rhodesiense* infection. These infections are seen typically in *morsitans* regions where the chief food supply of the fly is game or stock ; they are of sporadic occurrence and are unlikely to assume the form of considerable epidemics. We believe that *gambiense* infections likewise originated in this manner, but that having occurred in *palpalis* regions, where the contact between man and fly is more intimate than in *morsitans* regions, there was a correspondingly greater chance of man to man infection. Prolonged man-Glossina-man passage has produced the modifications of the parasite which have resulted in the characters of *T. gambiense*, the most striking of which is its 'fixed' resistance to the trypanocidal action of human serum."

Finally, the authors put a number of questions to which answers should be obtained.

A. G. B.

MESNIL (F.). Sur l'adaptation à l'homme des trypanosomes pathogènes de mammifères. [**The Adaptation to Man of Trypanosomes Pathogenic to Mammals.**]—*C.R. Acad. Sci.* 1930. July 21. Vol. 191. No. 3. pp. 120–122. [1 ref.]

For some time the trypanosomes pathogenic to man and those pathogenic to animals were regarded as different species, but the discovery of *T. rhodesiense* and its transmission by *G. morsitans* has led the English authors gradually to another conception. Being unable to distinguish *T. rhodesiense* from *T. brucei*, they put forward the hypothesis that the parasites were the same. This view was combatted by LAVERAN on the ground of cross immunity experiments, and by the Germans, on the ground of TAUTE and FISCHER's failure to inoculate man successfully with *T. brucei* [and one might add by many other persons of various nationalities on no grounds at all].

Mesnil, having discovered the sensitiveness of *T. rhodesiense* to human serum, expressed the view in 1914 that *T. rhodesiense* was of relatively recent adaptation to man. Reference is then made to the case of LANFRANCHI, who contracted trypanosomiasis in his laboratory. There is no doubt that he had *T. evansi* in his laboratory at the time he fell ill, but it is difficult to be certain with what he was infected, as immunological tests showed that *T. lanfranchii* had affinities both with *T. gambiense* and *T. evansi*.

Mesnil then records the instance of a laboratory assistant who was last year infected at the Pasteur Institute by a syringe containing *T. brucei*. He states that he had given only *T. brucei* to the laboratory in question. At Mesnil's request VAUCEL investigated the matter and has shown that the parasite obtained from the patient was the same as the strain labelled (in Mesnil's laboratory) *T. brucei* and was different from that labelled *T. gambiense*. [This work is, as yet, unpublished.]

Mesnil asks, How was this infection of man produced? He has always entertained the view that the power of human serum to act on pathogenic trypanosomes plays an important rôle in the refractory state of man. VAUCEL has investigated the strain in question and found that, although previously fairly sensitive to human serum [LAVERAN and MESNIL, 1901], it was very little so now. It was consequently in a condition very favourable to the infection of man. But this condition is without doubt insufficient. It is known that trypanosomes can be made resistant to cynocephalus serum without being able to infect this animal; and, moreover, at the request of the late Dr. SICARD three general paralytics were, at the beginning of 1929, inoculated with Mesnil's strain of *T. gambiense* without becoming infected [this is, as yet, unpublished]. The strain of *T. gambiense* used was that which Mesnil, in 1925, showed to be on the way to becoming sensitive to human serum; it is, however, still but little so and VAUCEL has shown that it is at least as refractory to human serum as the *T. brucei*. Mesnil thus arrives at the conclusion that other conditions are necessary for a trypanosome—of animal origin or animalized by conservation in laboratory animals—to force the human barrier. These conditions are without doubt of an individual order, and one may ask whether one of them is not dependent on the trypanocidal properties of the serum of a susceptible individual. This idea has been expressed by YORKE, ADAMS and MURGATROYD in a recent publication in order to explain the genesis of infections with *T. rhodesiense*. It explains the sporadic character of this disease in man which the Germans have not been able to transmit experimentally. Unfortunately, its verification is difficult on account of the antibodies which infected individuals speedily develop against the trypanosome. Mesnil has examined the trypanocidal power of the serum of the patient referred to against a heterologous trypanosome (*T. evansi*) and found it to be that of normal human serum. Be that as it may, it appears, however, to be demonstrated experimentally that a trypanosome of animal origin, such as *T. brucei*, can adapt itself to man, and this demonstration is itself of the greatest interest.

[The question of the action of normal human serum is fully discussed in the paper of YORKE, ADAMS and MURGATROYD summarized above. As is pointed out in this paper the therapeutic action of normal human serum in mice experimentally infected with *T. brucei* was discovered by LAVERAN in 1902. But LAVERAN and Mesnil, and those who followed them, were unable to demonstrate that human serum had any trypanocidal action *in vitro*, and furthermore, LAVERAN and Mesnil recorded that human plasma had but slight therapeutic action in infected mice. Although then Mesnil may have suspected that the insusceptibility of man was related to this property of human serum, the hypothesis could not be considered to rest on any solid foundation. In fact, ROSENTHAL and other German workers, who record that they had fully confirmed LAVERAN and Mesnil's observations on the inactivity of human serum and plasma *in vitro*, state most emphatically that this property of human serum is in no way related to man's immunity to the pathogenic trypanosomes of animals. The discovery by the reviewer and his colleagues that normal human serum and plasma exerted *in vitro* a pronounced trypanocidal action on the trypanosomes pathogenic to stock places the hypothesis on a satisfactory basis for the first time.]

W. Yorke.

CARPENTER (G. D. Hale). **Annual Report on Sleeping Sickness for 1928.**—*Uganda Protectorate Ann. Med. & San. Rep. for Year ended 31st December, 1928.* Appendix No. III. pp. 75–83. With 1 folding map. [Received 4th February, 1930.]

An account is given of new legislation governing the examination and control of persons inhabiting sleeping sickness areas. This is followed by a summary of the state of affairs in each year. It is remarked that almost all cases during the year have been treated with tryparsamide, and its less costly derivative tryponarsyl. MACLEOD reports from Aringa "The natives at first regarded treatment with suspicion and thirteen disappeared after receiving an injection. But the results obtained with tryparsamide were so dramatic that in a short time no difficulty was experienced in getting patients to attend regularly, and by November 16th 183 cases had received a full course of eight weekly injections of four grams for adult males and three for adult females. The same doses given twice weekly gave equally good results and no ill-effects were noticed." The number of injections of tryparsamide and tryponarsyl given at Gulu in 1928 was 1,580, and Dr. FREETH confirms previous experience that in advanced, as well as in early cases, apparent cure can be obtained by less than eight injections, so far as can be judged from signs, symptoms and examinations of the cerebro-spinal fluid. In some cases the trypanosome appears to be completely resistant to tryparsamide. Details are given of one such case—a boy aged 13—who received 48 injections (80 gm.) of tryparsamide between May, 1927, and August, 1928, and finally had to be treated with antimony and died.

Writing on the general outlook, Carpenter states that the combating of sleeping sickness presents an ever-increasing difficulty. Affairs are most disquieting in the Northern Province. The Eastern Province, except in the neighbourhood of Mjanji, appears to be free from the disease, and in the Western Province the disease is under control. The continual improvement of communications and increasing demands for labour, owing to commercial development of the country, lead to widespread movements and the intrusion of infected persons into clean areas. New outbreaks can in two instances (Murchison Bay and Aringa) definitely be attributed to this, and others are to be expected in the future.

W. Y.

MACLEAN (G.). **A Report on Human Trypanosomiasis in Tanganyika Territory for the Year ending 31st December, 1928.**—*Tanganyika Territory Ann. Med. & San. Rep. for Year ending 31st December, 1928.* IX. Scientific. pp. 170–191. [Received 21st March, 1930.]

In the previous year's report reference was made to an outbreak of sleeping sickness in Northern Tabora and the possible danger of spread to Kahama, Kibondo and Biharamulo was discussed. It was subsequently found that at that time the disease was actually spreading in the central part of the Kahama District. During 1928, sleeping sickness continued almost unabated, both in Northern Tabora and Kahama. Apart from an unimportant outbreak in Gongwe, a small scattered chiefdom in Ufipa, the position in the other areas is satisfactory. In 1928, 1,751 new cases of the disease were discovered and there were 395 deaths.

An account is given of the system of control at present in force in the Tanganyika Territory. This consists briefly in (1) the treatment of all cases, (2) the abolition of bush family villages and the aggregation of people into large settlements where land is suitable for development, (3) the prohibition of labour recruiting in the affected areas, and (4) the control of the movements of natives from one area to another.

The research being carried on at present is confined almost entirely to observations on epidemiology and treatment.

Epidemiology. It has not yet been possible to make a complete study of any outbreak in the Territory, but sufficient information has been accumulated to make the salient feature of epidemics clear. There is a close association between man and fly in bush villages. The people are bitten on their hunting and fishing expeditions, when they collect honey and wax, when they hoe their gardens, fetch their water or collect their firewood, and very frequently inside their houses. The majority have, however, lived for years without contracting sleeping sickness. While conditions have been fairly stable over short periods of time, there has been a slow but important change in the last fifty years; chiefly owing to re-distribution of population, there has been a gradual intensifying of the contact between man and tsetse. Probably before this contact was so intense there may have been sporadic cases of unrecognized *T. brucei* infection in man for an indefinite period. Finally, during the period of increased infestation a stage was reached when association between man and fly was sufficiently close and continuous for man-fly-man infection to take place. This condition having been established, all that would be necessary would be a fortuitous occurrence of a sufficient number of cases in a sufficiently small compass of time and space to start an epidemic; and having once started, there is no apparent reason why an epidemic should not spread as if the virus concerned were a true human parasite. Observations are cited in support of this hypothesis.

Treatment. Late cases treated with varying doses of Bayer 205 have invariably died, but in early cases apparent recovery is the rule. Generally speaking, tryparsamide given by itself was not found to be satisfactory. It is difficult to assess the value of combined treatment of Bayer 205 and tryparsamide because most patients find the treatment too prolonged and irksome to take a complete and regular course; nevertheless, it is the only form of treatment that has caused apparent recovery in late cases. A series of five patients was treated with stibamine glucoside, but none of them did well. Details are given of the situation in the various infected districts.

W. Y.

GILL (C. W. Hope). **A Comparative Study of Human Trypanosomiasis in Kano and in the Plateau Provinces (Northern Provinces of Nigeria).**—*West African Med. Jl.* Lagos. 1930. Jan. Vol. 3. No. 3. pp. 53–57. [1 ref.]

Two series, each of 52 cases of sleeping sickness, were examined as fully as was possible in the field. Diagnosis was made by discovery of the trypanosomes in the gland juice, series A was drawn from the flat Birnin Kudu and Gwaram districts of the south-east corner of Kano Province, and series B from the pagan village of Tof in the hilly Kaleri district of Pankshin division of Plateau Province. In the

former area, the only tsetse found was *G. tachinoides* and in the latter *G. palpalis*. As a control, 52 apparently healthy pagans drawn from a Kaleri village were subjected to a similar examination; the general conditions were similar to those at Tof, but sleeping sickness was absent. In series A, there were 42 males and 10 females; in series B, 36 males and 16 females, and in the control series, 36 males and 16 females. As regards age, 37 were under 16 years and 25 over 16 years in series A, and in series B and the control series, 4 were under 16 years and 48 over 16 years. The author explains the low incidence in children in series B by the fact that the majority of infections were probably contracted at the foot of the escarpment, 2,000 feet below, where children rarely ventured. In series A the duration of the illness varied from 10 days to 5 years, average 12·6 months, and in series B from 2 days to 3 years, average 7 months. The chief complaints in the two series are summarized in the Table.

The stage of the disease was diagnosed on clinical grounds, lumbar puncture not being a routine procedure: in series A, 21 were in an early stage of the disease and 31 in a late stage: in series B, 45 were in an early stage and 7 in a late stage.

Among the Kano Hausas, the occupations included farming, carrying water, fishing, hunting, cotton weaving and mat-making. The Tof pagans were all engaged in farming, but they frequently indulged in community beer-drinking and singing, and were accustomed to exchange visits with the villagers in the sleeping sickness country at the foot of the escarpment, some 2,000 feet below, where tsetse is prevalent. This was probably a prolific source of infection.

Data are also given regarding the condition of the cervical glands, pulse, temperature, blood pressure, general condition, somnolence, oedema, spleen, liver, heart, lungs, eyes, and nose. The auto-agglutination test was carried out in all three series. It was given by a number of apparently normal controls, but was usually more pronounced in the sleeping sickness cases; 90 per cent. of the sleeping sickness cases gave a positive formol-gel reaction, whilst only 2·5 per cent. of the controls did so.

The author concludes from his study that trypanosomiasis among the Tof pagans is of a distinctly milder character than among the Kano Hausas. He considers that the disease in the Tof pagans is similar in mildness and character to that described by Macfie (1914) in the Eket district, of the Southern Provinces of Nigeria.

W. Y.

Johnson (W. B.) & Lloyd (Llewellyn). **Report of Tsetse Investigation, 1928.**—*Nigeria Ann. Med. & San. Rep. for Year 1928.* Appendix B. pp. 47–64. With 4 figs. on 2 plates & 4 folding maps.

The experimental clearing of Sherifuri in which the main foci of *G. morsitans* and *G. tachinoides* are being eliminated over a wide area has been continued. The clearing now extends for 9½ miles along the Katagum river, and for 8 miles along the Kiyawa river. The distance between the ends of the lines of clearing to the east is 3 miles, and to the west is 8½ miles, the area being approximately 100 square miles. There are no known primary foci of tsetse to the north or south of this area for a long distance. In four maps the original state of affairs and the amount of clearing done in three successive seasons is shown; and in a table the density is given of the flies in the succeeding years at certain

fixed points at two periods of the year, viz., April to June, when only primary foci are heavily infested, and September to November when secondary foci have their heaviest infestation ; the density is represented by the average number of flies caught per net per hour. Other details regarding the clearing experiments in the Sherifuri and Gombe division are given.

Experience has shown that deferred grass burning in Northern Nigeria does little to reduce established thicket, although it is undoubtedly a benefit in checking its extension. Late grass burning is also of great value in checking new growth in cleared areas. An experiment was undertaken in which it was attempted to burn out established thicket by stacking grass round its edge and firing it in the late dry season as recommended by SWYNNERTON in Tanganyika. The fire was fierce, but failed to penetrate the thicket to any considerable depth. At the time of burning the density of *G. tachinoides* was 38 flies per net-hour ; the day after the fire it was 14, and 6 days later 12 flies per net-hour. The day before the fire 154 of the flies were caught and released again after marking them with a spot of paint on the thorax. The day after the fire 13 (8·4 per cent.) of these were recaught in the pool, and in all, 24 per cent. of those marked were recaptured in the following six weeks. From work of this sort, it appeared that the fire had destroyed about one-half of the tsetse infesting the pool. In the following wet season the focus was thoroughly repopulated, the density in October being 53 flies per net-hour.

The next portion of the report deals with the practical application of the adhesion phenomenon, and this is followed by an account of the experiments undertaken with the object of ascertaining the number of trypanosomes injected by infected tsetse flies. All this work has been published elsewhere and noticed in this *Bulletin.*

The last portion of the report deals with the work of the Sleeping Sickness Officers. Apparently a number of centres of sleeping sickness have been discovered in the Northern Province, and there is no doubt that during the last few years the disease has been spreading and increasing to an alarming extent. A great and almost unbroken zone is found around Kano ; this area yielded 912 cases. In addition, 47 cases were found in the Hadeija division and 88 cases in the Katsina division. In the Katagum division 472 cases were found and treated at Sherifuri. In the western part of the Plateau Province many cases were found, viz., 445 at Mama, 320 at Womba, 21 at Jemaa-Kagoro and 707 cases near Kwakwi. In all, 3,012 cases have been treated and most of them have received an adequate course of tryparsamide.

A special effort has been made by two of the Medical Officers to trace as many of the sleeping sickness cases treated at Sherifuri as possible. The patients were all treated by intravenous injection, the early ones mainly with Bayer 205 and the later ones mainly with tryparsamide. When neither of these drugs was available tartar emetic was used. The heavy mortality (65 per cent. of those traced) was partly due to an epidemic of relapsing fever which occurred in 1924–25 and caused a high death rate with some desertion of villages. Of the 975 cases treated at Sherifuri 453 have not been traced. The results obtained by the use of the drugs and their combinations are shown in a series of tables. The full course of tryparsamide was 13 gm. and that of germanin 5 gm. Cases which have relapsed or have not made satisfactory progress after one course were given another course of treatment.

W. Y.

GORDON (R. M.) & AIDIN (R.). **Report on Trypanosomiasis in the Cape Peninsula, together with an Account of the Prevalence of Infected and Uninfected Tsetse-Flies in the same Area.**—*Sierra Leone Ann. Med. & San. Rep. 1928.* pp. 77–84. With 4 plates (1 map). [6 refs.]

—— & DAVEY (T. H.). **An Account of Trypanosomiasis at the Cape Lighthouse Peninsula, Sierra Leone.**—*Ann. Trop. Med. & Parasit.* 1930. July 8. Vol. 24. No. 2. pp. 289–318. With 1 graph & 1 map in text & 6 figs. on 3 plates. [9 refs.] [Sir Alfred Lewis Jones Research Lab., Freetown.]

In the early part of 1928 trypanosomes were found in the blood or gland juice of two patients in the village of Aberdeen, Sierra Leone. In view of this discovery and of the fact that attention had been drawn to the high proportion of the children attending school at Aberdeen with enlarged cervical glands, the desirability of a thorough medical examination of the inhabitants of Aberdeen and their domestic animals was suggested. In all, 169 persons of five years of age and upwards out of a total population of 590 presented themselves. Apart from the two individuals mentioned, no cases of sleeping sickness were discovered. The authors state that if it had been possible to examine a large number of natives probably more cases would have been detected, and that certain cases recorded by them as highly suspicious were probably trypanosomiasis in which partial immunity had developed and the trypanosomes had become too scanty for detection by ordinary methods of examination.

Seventy animals (43 sheep and 27 goats) were examined by means of a single fresh blood film, but no trypanosomes were found. Dogs were very common in the village of Aberdeen, but it was considered impracticable to examine them. With the exception of monkeys and squirrels, very few wild animals were observed. A number of antelope exist in the uncleared portions of the peninsula.

General observations regarding the destruction of tsetse were made in June, July and August. The fly was found to be fairly numerous all over the peninsula ; they were never observed following the ferry-boat from the mainland to Aberdeen, but were often found to accompany the boat on its return journey. Of 209 flies dissected, 40 were found to be infected. This percentage (19·1) of infected flies is very much greater than that found by BLACKLOCK in 1922 (5·9) and YORKE and BLACKLOCK in 1905 (4·7) and calls for explanation. The authors state that there must be some large reservoir of vertebrate hosts from which the flies are obtaining infection, but they add " that up to the present they have completely failed to discover the nature of these hosts." Infections were mostly limited to the proboscis, but in a few gut infections were also found. In no case was a salivary gland infection discovered.

The following recommendations are made :—

" 1. The clearing on the Peninsula is undoubtedly proving successful and should be continued. We consider that the best results would be obtained by abandoning work on isolated areas and instead concentrating all available labour in a combined effort to continue the complete clearing from the Lighthouse towards the mainland. At present this clearing extends as far as the isthmus at Man-of-War Bay and only represents a total area of about half a square mile. When a sufficiently large area has been cleared further observations could be made as to the number of flies occurring, and from these results it should be possible to reach a conclusion,

unobtainable from the present small area, as to the possibility of completely eradicating the tsetse fly from the district.

"2. A larger proportion of the inhabitants of Aberdeen should be medically examined for the presence of trypanosomes. Suspicious cases in addition to those we have already recorded, should be kept under observation and re-examined at intervals.

"3. An attempt should be made to ascertain whether fly are, or are not, breeding on the completely cleared area.

"4. The failure to discover the host responsible for the high proportion of infected fly suggests the advisability of an examination of the wild animals (deer, etc.) occurring in the Peninsula and of a further examination of the domestic stock at Aberdeen." W. Y.

BOYÉ. La maladie du sommeil en Afrique Occidentale Française, au Sénégal, dans la Haute-Volta et au Dahomey. [**Sleeping Sickness in French West Africa, Senegal, Upper Volta and Dahomey.**]—*Bull. Office Internat. d'Hyg. Publique.* 1930. Apr. Vol. 22. No. 4. pp. 749–753.

The author briefly summarizes the position of knowledge regarding sleeping sickness in the French West African Colonies. In Senegal there is a little endemic focus at Sangalcam some miles from Rufisque; in the neighbouring forests *Glossina palpalis* is found. A search made in 1928 revealed 8 infected persons. It is very probable that there also exist in the West African Colonies other small foci. A case was found at Dakar during 1928 in a native from the French Guinea. In the Sudan 4 cases were discovered in 1927, but the reports from Mauritania, the Niger and the Ivory Coast do not mention the disease.

In Haute-Volta and in Dahomey cases are more numerous. During the past few years small foci have been found on the banks of the Volta-Noire and a large focus at Sakoïnsé. The most recent investigations have shown that sleeping sickness occurs endemically in a certain number of districts in the south and centre of the Colony, but does not extend beyond 13° N. Details are given regarding what has been found in the various portions of the Colony.

In 1926 and 1927 a focus of the disease was found at Togo; 25,694 persons were examined and 1,325 cases of the disease discovered. In 1928 a prophylactic sector was organized at Djougou in Dahomey, the population of which was 69,000 in a territory of 12,275 sq. kilometres. From September, 1928, to January, 1929, 27,795 persons were examined, and of these 1,198 were found to be infected and 1,141 were classified as suspects. The Tchelenga region was the most heavily infected, 18·7 per cent. of the population having the disease: in the canton of Sorouba 15·08 per cent. were infected, but in other cantons the incidence was slight and some were entirely free from the disease. W. Y.

MURAZ (G.). Réorganisation du service de la maladie du sommeil en Afrique Equatoriale Française. [**Reorganization of the Sleeping Sickness Service in French Equatorial Africa.**]—*Bull. Soc. Path. Exot.* 1930. Mar. 12. Vol. 23. No. 3. pp. 331–341. With 1 folding map. [1 ref.]

The first portion of this paper gives a brief account of the development of the sleeping sickness service in French Equatorial Africa since the war. In 1918 work was undertaken in one sector only; in 1922 there

were 10 sectors and in 1929 no less than 28 sectors in which anti-sleeping sickness work was being undertaken. In 1922 all 10 sectors were supervised by medical men, but in the following year, owing to shortage of doctors, only 3 of the sectors functioned normally. This regrettable situation has been gradually improved. Owing to this defective organization, it is not surprising that in French Equatorial Africa only 30,000 cases of sleeping sickness are recorded, whereas in the Cameroons, in infected areas of only a ninth the size, 130,000 cases are recorded. The author does not believe that the morbidity in the Cameroons is any higher than it really is in French Equatorial Africa. A table shows the extent of the infected areas in the two countries and the medical service available in each. In the latter respect French Equatorial Africa compares very unfavourably with the much smaller Cameroons.

The article concludes with a statement of the personnel and organization required and of the standard treatment which, in the author's opinion, should be administered to patients in the various stages of the disease.

W. Y.

LEDENTU (G.). A propos de la lutte contre la maladie du sommeil. [**Anti-Sleeping-Sickness Measures.**]—*Bull. Soc. Path. Exot.* 1929. Nov. 13. Vol. 22. No. 9. pp. 779–785.

This article is called forth by that of JAMOT on sleeping sickness in Cameroon (*ante*, p. 222). The author quotes JAMOT's statement that there is no known drug that can rival atoxyl for causing temporary abatement of a focus of sleeping sickness. He agrees with JAMOT regarding the value of atoxyl for sterilizing the peripheral circulation. JAMOT himself remarks that for this purpose atoxyl is superior to tryparsamide.

Ledentu differs from JAMOT regarding the importance of lumbar puncture as an aid to diagnosis and as a means of controlling treatment. In Ledentu's view this is a procedure of the greatest importance. He does not agree with JAMOT that it is contraindicated in the first stage. There does not appear to him to be any real danger of infecting the spinal fluid and he points out that this fear does not prevent its being done in syphilis.

W. Y.

BOURGUIGNON (G. C.). De l'importance actuelle de la ponction lumbaire dans le dépistage et le traitement de la maladie du sommeil. [**Importance of Lumbar Puncture in Detection and Treatment of S.S.**]—*Bull. Soc. Path. Exot.* 1930. Jan. 8. Vol. 23. No. 1. pp. 90–99.

This article, which is called forth by that of JAMOT [*ante*, p. 222], stresses the importance of lumbar puncture in the diagnosis of sleeping sickness and as a means of control of treatment. The author does not produce any new facts in support of his contentions, but illustrates his arguments from the data supplied in papers previously published.

W. Y.

CORSON (J. F.). **Observations on the Infectivity of** *Trypanosoma rhodesiense* **in a Relapsed Case of Sleeping Sickness during Treatment with Tryparsamide.**—*Jl. Trop. Med. & Hyg.* 1930. July 1. Vol. 33. No. 13. pp. 187–188. [5 refs.]

The work of medical officers in Tanganyika has shown that tryparsamide has much less effect on *T. rhodesiense* in man than on *T. gam-*

biense. A relapsed case of Rhodesian sleeping sickness having come under the author's observation, he decided to try giving tryparsamide chiefly when trypanosomes appeared in the blood, having in mind the possibility of a vaccinating effect and also the idea that the trypanosomes might be derived partly from those that resisted the last dose of tryparsamide as well as from the central nervous system. Reference is made to BROWNING and GULBRANSEN's observation that the administration of the same dose of a styrylquinoline compound at each relapse cured mice infected with *T. brucei* [this *Bulletin*, Vol. 25, p. 343], and to that of KLIGLER and WEITZMAN, who found that the injection of trypanosomes with Bayer 205 produced an increased resistance to infection in laboratory animals, greater than could be attributed to the action of the drug alone. [*loc. cit.*, Vol. 24, p. 573].

In the present case the opportunity was taken to test the action of tryparsamide on the infectivity of the trypanosomes by inoculating white rats with the patient's blood when trypanosomes appeared in it.

Details of the case are given : a series of rats, inoculated at different times when trypanosomes reappeared in the blood after administration of tryparsamide, all became infected, as did also a pair of rats inoculated before typarsamide was given. The infection in one of these two rats resisted a subcutaneous injection of 0·6 cc. of a 2 per cent. solution of tryparsamide.

The following are the comments and conclusions :—

" (1) Although in our present ignorance of differences of susceptibility of different persons to trypanosome infection, figures of incidence in a population cannot properly be applied to the question of reinfection or relapse, the history of this patient and the present low incidence of sleeping sickness in this district warrant the opinion that it is a case of relapse.

" (2) The continued infectivity of the trypanosomes supports the view, based on clinical observations, that tryparsamide, in doses that can be given without much risk of causing permanent blindness, has little curative value in the later period of Rhodesian sleeping sickness.

" (3) As many of the patients who are discharged from hospitals have relapses, the question of periodical infectivity to tsetse flies of the blood of relapsed patients who are not severely ill is probably of some practical importance.

" (4) Although it seems reasonable to suppose that, under natural conditions, infectivity, as shown by the direct inoculation of susceptible animals, will usually be in accord with infectivity to tsetse flies, and may be related to virulence, it is desirable that parallel experiments should be made to estimate the amount of agreement, as the former method is so much simpler and quicker than the latter."

W. Y.

BARLOVATZ (A.). La trypanosomiase arsénorésistante est-elle transmissible d'homme à homme ? [**Possible Transmission of Arsenic Resistant Trypanosomiasis.**]—*Bull. Soc. Path. Exot.* 1930. May 14. Vol. 23. No. 5. pp. 499–505.

In the introduction to this paper the author discusses the very great difficulties in the way of obtaining an absolute answer to the important question whether arsenic-resistance is transferred from man to man by Glossina. He then passes to a consideration of certain observations made by him in Mayumbe, which, although they do not furnish definite proof, yet suggest strongly that arsenic-resistance is transmitted from man to man.

In 1929, a patient infected with trypanosomes, resistant to tryparsamide, visited the village of Kiniati and remained there without treatment for more than two months. At the end of the year 2 or 3 new cases of the disease were discovered in this village which were more than usually resistant to tryparsamide, although to different degrees. Kiniati lies in a district containing 20,000 persons who are but slightly affected with sleeping sickness and amongst whom no case of arsenic-resistance was discovered during 1928–1929. Furthermore, other recent cases occurring in other villages of the district were all sterilized by 2 gm. of tryparsamide.

The facts relating to the infected persons in the village of Kiniati are given in great detail, and the author subsequently passes to an analysis of them and of the objections which can be raised to the hypothesis that in the cases quoted the arsenic-resistant character of the trypanosomes was actually passed from one individual to another through the intermediary of Glossina. [The paper is an interesting one and should be consulted in the original.]

W. Y.

CURSON (H. H.). **Nagana in Zululand.**—*13th & 14th Reports of the Director of Vet. Education & Research.* 1928. Oct. pp. 309–412. With 8 diagrams, 3 folding maps, 36 figs. on 18 plates & 2 coloured plates.

This lengthy report is mainly of veterinary interest, but one observation of medical importance was made. This was an experiment devised with the object of confirming TAUTE and HUBER'S (1919) observation that *T. brucei* is not pathogenic for man. The author states that no record exists of any human being having contracted sleeping sickness in Zululand, and in spite of BRUCE'S (1915) statement that "many cases of death occurred among hunters and explorers, which were usually put down to malaria, but it is possible some of these may have been due to infection by nagana," it is safe to assert that the disease does not occur in the country. Thousands of persons, especially natives, are bitten by Glossina annually without untoward results. In order, however, to obtain experimental proof in support of this information, a small experiment was undertaken.

A European and two natives were inoculated subcutaneously with the citrated blood from a horse infected with *T. brucei*. At the same time a considerable number of animals, ranging from white mice to bovines, were inoculated at the same time and became infected. The results of these animal inoculations are shown in a table. The human beings did not become infected and animals subinoculated from them remained negative.

W. Y.

BABLET (J.). A propos de deux auto-observations de trypanosomiase africaine. [**Two Self-observed Cases of African Trypanosomiasis.**] —*Bull. Soc. Path. Exot.* 1929. Dec. 11. Vol. 22. No. 10. pp. 949–962. With 1 chart in text. [25 refs.]

The author remarks that although a considerable number of the French Colonial Medical Officers have become infected with trypanosomiasis only one of them, KÉRANDEL (1910), has published an account

of his case. He thinks that it will not be without interest to record his own case. The special interest of the record lies in a detailed account of the early symptoms and in the results of treatment. It resembled that of KÉRANDEL in the following respects :—

1. The appearance of the disease after a tour of a month in a heavily infected country, thus giving an incubation period of less than four weeks.

2. A pseudo-furuncle, indicating without doubt the site of infection, appeared shortly before the fever, and rapidly subsided leaving a scar.

3. The character and duration of the initial fever was very similar in the two cases.

4. Dysenteric diarrhoea lasted about a month.

5. Intermittent fever, headache, insomnia, tachycardia, and loss of weight, followed the initial febrile disturbance during the period before treatment.

6. A circinate papular erythema (trypanide) appeared 2½ months after the commencement of the disease.

7. Autoagglutination of the red cells was observed during the same period.

The two cases differed markedly in so far as infection of the blood and gland juice was concerned. In the present case there was marked and persistent infection of the glands, whilst in KÉRANDEL the glands were scarcely involved ; in the latter there was an early and persistent septicaemia which was resistant to all arsenicals, but in the present case the blood infection was light.

The author then passes to an interesting résumé of the clinical characters of the disease in the European cases which have been recorded in France during the last twenty years ; and this is followed by certain therapeutic considerations.

Finally, as a result of study of these two cases and of about 100 published cases the author reaches the following general conclusions :—

1. There is great variation in the time at which the symptoms of the disease manifest themselves : the incubation period varies from a few days to 3 or 4 weeks, and the terminal phase may appear within a few months or may be delayed for many years.

2. The invasion by the parasites of the blood, gland juice, or cerebrospinal fluid does not appear to follow any definite rule.

3. The most constant clinical signs during the first three months are : initial fever of a remittent type succeeded by attacks at shorter or longer intervals of headache, insomnia, tachycardia ; autoagglutination of the red cells, asthenia, polyadenitis, circinate papular erythema of the thorax and limbs, and deep hyperaesthesia (Kérandel's sign). The initial pseudo-furuncle appears to be connected with the bite of an infected Glossina.

4. Search for the trypanosomes ought to be made simultaneously in the centrifuged blood, in the various lymphatic glands, and in the cerebrospinal fluid. Small doses of atoxyl sometimes provoke the appearance of parasites in the blood.

5. From the point of view of therapy, the combination of atoxyl and emetic, or of salvarsan with these, appears to sterilize rapidly recent cases and to exert a favourable influence in older cases.

6. A " security treatment " with atoxyl is necessary. The formula of MARTIN and DARRÉ—0·5 gm. of atoxyl every 5 days—gives excellent results and should be continued for at least 6 months. During the whole of this period it is necessary to watch the patient with great care.

W. Y.

SICÉ (A.). Contribution à l'étude de l'évolution de la trypanosomiase humaine. Renseignements fournis par la rachicentèse. [**Development of Human Trypanosomiasis: Information furnished by Lumbar Puncture.**]—*Bull. Soc. Path. Exot.* 1929. Dec. 11. Vol. 22. No. 10. pp. 962–970. [6 refs.] [Pasteur Inst., Brazzaville.]

A number of Europeans, who were found to be suffering from sleeping sickness after seven months sojourn in French Equatorial Africa, were willing to allow of lumbar puncture, and thus it was possible to ascertain the length of time which elapsed between the date of probable infection and the first manifestations of cerebrospinal involvement. The cerebrospinal fluid of normal Europeans contains at most 1 or 2 cells per cmm. and the amount of albumin does not exceed 20 cgm. per 1,000. Details are given regarding four such cases. To these observations are added a number of others made on treated native cases; in all these the blood or gland juice was infected and the cerebrospinal fluid absolutely normal before treatment. They did not suffer from any blood relapse, but the evolution of the disease was followed by watching the changes in the spinal fluid. Ten such cases are described in detail.

Study of the European cases shows the brevity of the first stage of the disease and the precocity of the first meningeal reaction. Certain of the treated native cases showed a normal spinal fluid until the second year and then a pronounced cellular reaction with hyperalbumen content; the trypanosome was not found; it would only appear later when the meningeal membrane had lost its integrity.

Sicé refers to the literature from which it appears that certain authors on clinical grounds had suspected the early involvement of the central nervous system. As a matter of fact, spinal puncture indicates that the first period is short; the virus quickly attacks the meninges and later the nervous tisue. Human trypanosomiasis is a disease of the cerebrospinal system.

Two conclusions appear to arise from this work:—

1. The necessity for early recognition of the infection.
2. A very careful supervision during the second year following the initial diagnosis of the first stage (infection of the blood and gland juice, absolute integrity of the spinal fluid). From the 15th month it is necessary to perform lumbar punctures each 6 months for at least 18 months.

W. Y.

SICÉ (A.). Cinq ans et demi de pratique de la ponction lombaire, appliquée à la trypanosomiase humaine. [**Five and a Half Years of Lumbar Puncture in Human Trypanosomiasis.**]—*Bull. Soc. Path. Exot.* 1930. Jan. 8. Vol. 23. No. 1. pp. 23–28. [4 refs.] [Pasteur Inst., Brazzaville.]

In view of the general recognition that lumbar puncture is an important procedure in the diagnosis and treatment of sleeping sickness, the author considered that it would be useful to summarize his experience of this operation during the period January 1st, 1924. to June 30th, 1929. Lumbar puncture has by degrees become a regular practice before treatment, during treatment, at the end of treatment and again some time later. He has reached the conclusion that it

can be performed without apprehension. [See also BLANCHARD and LAIGRET: this *Bulletin*, Vol. 21, p. 924.]

During the period in question 1,460 patients suffering from sleeping sickness came under observation for the first time at Brazzaville. Details regarding the condition of the spinal fluid and blood and lymph juice are given in a table.

It is noted of these 1,460 patients that spinal puncture was not performed in 110 (7·5 per cent.); these exceptions occurred mainly at the beginning of the period when the organization was not so complete as it became later; they also include some Europeans who refused puncture. Now, however, all alike are completely examined and some of the 110 were examined later.

In 190 patients (13·01 per cent.) the diagnosis of nervous trypanosomiasis was due to lumbar puncture. In 489 (35·5 per cent. [?33]) the disease was shown to be in the first stage, the spinal fluid being normal; and annual examination has shown that in 189 of these (38·65 per cent.) the disease has not advanced, notwithstanding the fact that some of them have suffered from blood relapses for which they were treated; in thirty, however, the disease was found by spinal puncture to have advanced.

The author considers the question whether direct infection of the spinal canal by lumbar puncture had anything to do with the evolution of the disease in these cases. He considers this unlikely because in none of them was the evolution discovered in less than a period of 15 months, and for other reasons which he discusses.

In all, 882 patients showed involvement of the central nervous system; in default of definite nervous symptoms most of them were recognized as such by lumbar puncture: 224 (25·4 per cent.) of these were cured in that after 2½ years the disease had not advanced and the spinal fluid had become normal, although, unfortunately, many of the symptoms due to damage of the nervous system remained; 359 (40·7 per cent.) were improved, the spinal fluid, although it had not become normal, having progressed in that direction.

W. Y.

SICÉ (A.). La rachicentèse dans la trypanosomiase humaine. Ses indications, sa valeur. [**Lumbar Puncture in Human Trypanosomiasis. Indications and Value.**]—*Bull. Soc. Path. Exot.* 1930. Jan. 8, Feb. 12 & Mar. 12. Vol. 23. Nos. 1, 2 & 3. pp. 77–90; 222–243; 307–331. With 75 text figs. [9 refs.] [Pasteur Inst., Brazzaville.]

Although lumbar puncture was occasionally employed, the usual means of diagnosing trypanosomiasis was, prior to 1922, blood and gland juice examination. In 1922, LEFROU and OUZILLEAU published a study of the examination of 240 spinal fluids and established the importance of the cytological and chemical investigation of this fluid. Their work was continued by LEDENTU and VAUCEL; and in the present paper the author proposes to deal with observations made on the oldest cases which have been kept under regular observation and to consider what conclusions can be drawn. Sicé has practically limited his observations to the cellular content, the albumin content and to the flocculation test. He has designedly omitted reference to the presence or absence of trypanosomes in the spinal fluid because

this does not appear to obey any rule ; nevertheless, this question is of importance when in the course of long treatment the parasites are discovered in centrifugation of the spinal fluid since their appearance signifies the beginning of the end.

A description is given of the author's technique in making a lumbar puncture. The patient is seated ; a needle 6 to 7 cm. in length is used, which should not be too fine as the lumbar tissues in the native are sometimes very tough. The operation should be performed gently and the puncture made immediately below the fourth lumbar spine. The fluid, which is always like spring water, is collected drop by drop until about 5 cc. is obtained. Practically no disturbance is caused by the puncture, except that in very advanced cases there may be pain, but the great majority of patients are not disturbed by it.

Cellular reaction. LEFROU and OUZILLEAU considered that above 20 cells indicates a pathological meningeal reaction. This, in Sicé's view, is incontestable ; in fact, he believes, as a result of the frequency of less than 10 cells found in natives exhibiting no nervous lesions, that it would be safe to make a diagnosis of meningeal reaction on fewer than 20 cells. The matter is, however, not of great importance, as the number of cells is not always a true criterion of the gravity of the lesions. Often a figure of 1,000 cells with an increased amount of albumin is, from the prognostic point of view, less alarming than a count of 50 cells with 0·40 or 0·50 of albumin. LEFROU and OUZILLEAU have described the types of cells found. Sicé points out that although the lymphocytes always constitute the great majority of the cells present, medium sized mononuclears are sometimes found in small numbers even from the beginning. In the more advanced cases dead cells are found intermingled with the living ones, and in particular leucocytes with segmented nucleus, plasmocytes, and also the cells described as " mulberry cells."

Quantity of albumin. This is examined in the spinal albuminometer of Sicard and Gantaloube, using trichloracetic acid as the reagent. If there is a considerable cellular reaction the cells should first be be precipitated by centrifugation.

Flocculation. The application of the colloidal benzoin test of Quillain, Larouche and Léchelle furnishes useful information. LEDENTU and VAUCEL have reported fully on this reaction in sleeping sickness [see this *Bulletin*, Vol. 25, p. 335] and have shown how, under the influence of treatment, the reaction disappears first from the paralytic zone and then from the syphilitic zone *pari passu* with the improvement in the other reactions.

The cellular reaction, the hyperalbuminosis, the presence of trypanosomes and flocculation are all indicative of anatomical lesions in the meninges and central nervous system ; and the spinal fluid should be regarded as a mirror which reflects faithfully all the successive injuries done to the nervous system by the flagellates. An analysis of 10,000 spinal punctures made at Brazzaville during more than four years has enabled Sicé to describe the sequence of events.

The earliest reaction resulting from meningeal lesion is the cellular reaction. It is at first slight and unaccompanied by clincal signs ; it progresses usually slowly, exceptionally rapidly, and the intensity of the meningeal lesions discloses itself by the number of cells and by their quality. Leucocytes in a state of full vitality are indicative of lesions which, if not recent, are at least active ; but plasma cells, dead cells, mulberry cells indicate older and chronic lesions showing a tendency to sclerosis.

As the cellular reaction develops the albumin content gradually increases. At first the increase is parallel to that of the cells 0·40 gm., 0·60 gm., 0·80 gm., 1·0 gm. and rarely 1·20 gm. or even 1·30 gm. As the condition advances the two reactions tend to oppose one another ; at death or in a chronic condition there is a limited number of cells (about 100) and an increase of albumin (0·40 to 0·50 per cent.).

Observation of the amount of albumin in the spinal fluid is a matter of capital importance, as this is the only factor on which one can place complete reliance from the point of view of prognosis. The author states that he will not hazard an opinion regarding the origin of the hyperalbuminosis, as his researches on this matter have not been convincing. He believes that part of it comes from the blood and part from the nervous system itself.

Then follow details of 75 of the oldest cases in whom it has been possible to make methodical and regular observations on the spinal fluid and to trace the evolution of nervous disease. The patients are divided into two groups : Group A, who exhibited at the first puncture a normal spinal fluid ; and Group B in whom at the first examination the spinal fluid was altered. [These details, which are very interesting, and are illustrated by graphs showing the progressive changes, should be consulted in the original.]

Analysis shows the necessity of systematic examination of the spinal fluid. In the author's cases puncture was made every three months during the first year, each six months during the second year and thereafter annually. On some occasions it enabled a diagnosis to be made when blood examination and gland puncture were negative. It enabled an opinion to be formed regarding the stage of the disease and finally it enabled a decision to be reached on the proper therapeutic measures to be followed.

W. Y.

DUBOIS (A.). Remarques d'ordre historique à propos de la rachicentèse dans la trypanosomiase humaine. [**History of Lumbar Puncture in Human Trypanosomiasis.**]—*Bull. Soc. Path. Exot.* 1930. Mar. 12. Vol. 23. No. 3. pp. 289–290. [2 refs.]

The author wishes to correct SICÉ when he states that LEFROU and OUZILLEAU were the first, in 1922, to emphasize the importance of lumbar puncture for the diagnosis of the period of sleeping sickness and for the control of treatment. BRODEN and RODHAIN were in reality the first to draw attention to the importance of lumbar puncture in their papers published in 1908 and 1909 ; and since this time lumbar puncture has been a common practice at Leopoldville. Dubois also mentions that so early as 1911 he made frequent use of lumbar puncture during his three or four monthly tours of the river villages in the Congo for the diagnosis and treatment of sleeping sickness.

W. Y.

SICÉ (A.). La rachicentèse dans la trypanosomiase humaine. A propos de la note de A. Dubois. [**Lumbar Puncture in Human Trypanosomiasis.**]—*Bull. Soc. Path. Exot.* 1930. June 11. Vol. 23. No. 6. pp. 582–584. [3 refs.] [Pasteur Inst., Brazzaville.]

The author replies to DUBOIS that he had not overlooked the work of BRODEN and RODHAIN, but that he had simply chosen to cite that

of LEFROU and OUZILLEAU, because it appeared to him to be the more weighty. He also refers to DUBOIS' query whether the spinal fluid in trypanosomiasis is, as Sicé said in his earlier paper, always like "eau de roche" [spring water]. DUBOIS remarked that in cases of notable cellular reaction it might be opalescent. Sicé considers that the qualification "notable" requires definition. He himself had always found the fluid clear even when the cell content was as great as 1,000 to 2,000 per cmm. and even in the few cases seen where the count varied between 2,000 and 5,000 cells per cmm. He quotes one case where the count was only 355 cells per cmm. and yet the spinal fluid was cloudy; from this fluid, however, pneumococci were isolated.

W. Y.

SICÉ (A.). Chlorurorachie et glycorachie dans la trypanosomiase humaine. [**C.S.F. Content in Chlorine and Sugar in Human Trypanosomiasis.**]—*Bull. Soc. Path. Exot.* 1930. June 11. Vol. 23. No. 6. pp. 640–650. [20 refs.] [Pasteur Inst., Brazzaville.]

The author has examined the chlorine and sugar content in the spinal fluid of cases of sleeping sickness.

The determination of the chlorides was made by Mestrezat's method. The solution of silver nitrate used was adjusted for a solution consisting of 2 cc. of fused sodium chloride 10 gm. to the litre, 10 cc. of distilled water and a few drops of an indicator consisting of 10 per cent. potassium chromate: the solution of silver nitrate was so arranged that 10 cc. exactly were required for the above solution. In the test the 2 cc. of sodium chloride (10 gm. to the litre) solution was replaced by 2 cc. of spinal fluid: the number of cc. of the standard silver nitrate solution required then gave the number of gm. of sodium chloride per litre in the spinal fluid.

The sugar determination was made by Mestrezat's modification of Benedict and Osterberg's method.

The following are among the conclusions:—

In nervous trypanosomiasis the spinal fluid is modified not only by the leucocyte reaction and increase in albumin, but by a diminution in the quantity of chlorides and sugar.

This diminution indicates the state of the lesions and the progress of the infection.

Efficacious treatment limits the diminution of chlorides and sugar, and both tend to become more regular in amount. Exceptions, when they occur, are generally amongst the incurables, and when such are encountered the prognosis ought to be very guarded.

W. Y.

GILL (C. W. Hope). **The Tube Method of Gland Puncture in Sleeping Sickness.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1930. Apr. 17. Vol. 23. No. 6. pp. 643–644.

The author describes a substitute for the use of the ordinary syringe for the purpose of gland puncture and enumerates various advantages which he considers his apparatus to possess. It is as follows:—

"The substitute for the syringe consists of about 2 ft. of small diameter rubber tubing cut in half and rejoined by the bulb portion of a 5 c.cm. pipette. Into one free end is now inserted a glass mouthpiece (as used with blood count pipettes), and into the other the socket of a small hypodermic needle."

W. Y.

ARNAUD (R.). Au sujet du moranyl. Deux opérations de moranylisation dans le Moyen-Congo. [**Moranyl. Results of its Prophylactic Use in the Middle Congo.**]—*Bull. Soc. Path. Exot.* 1929. Nov. 13. Vol. 22. No. 9. pp. 872–880.

The observations referred to were made in two districts of the subdivision of Sibiti in the Middle Congo, viz., Goma-Sangha and Boungou-Pandi, where the percentage of infected in September, 1927, was respectively 51·8 and 74. The following instructions were given to BASILE in performing the test :—

1. To make a very careful survey in order to avoid injecting early cases of sleeping sickness.
2. To give the healthy an injection of moranyl to the amount of 1 gm. in 5 cc. of water, i.e., 2 cgm. per kilo.
3. To atoxylize or re-atoxylize all the infected.
4. To keep the pregnant females as control.

The injections were made on November 12th by BASILE and his assistants as follows :—

	Seen.	Injected.	Not injected.
Goma-Sangha	709	333	45
Boungou-Pandi	587	230	27
	1,296	563	72

Details are given concerning the re-examination of these people about a month and 13 months later. From the tables it appears that as high a proportion of the moranylized were infected as among the non-moranylized, i.e., about 18 per cent. for each category.

This unexpected result, which is at variance with the observations of BOSSERT and TRÉVISE [see this *Bulletin*, Vol. 24, p. 959], caused the author to consider possible fallacies. Three factors seemed to him capable of influencing the results, viz. : insufficient preliminary examination which might cause certain early cases to be overlooked ; the preparation of the solution ; and, lastly, the dosage given. Whilst it is possible that errors in each of these three proceedings might have operated, it is in the last that the author believes the main fault to lie. BASILE and his assistant had no scales and could not weigh their patients, and consequently the dose given was often quite inadequate. The 450 moranylized seen by Arnaud at the second examination, i.e., 13 months after the injections, were all weighed and the dose of moranyl given calculated per kilo of body weight. The following analysis of the result is given :—

Dose of moranyl received per kilo. of body weight.	Number injected.	New cases.	Percentages.
0·02 gm.	25	0	0
0·02 to 0·015 gm.	57	4	7
0·015 to 0·01 gm.	247	41	17
less than 0·01	121	39	32

The result is striking : no case receiving 0·02 gm. per kilo. became infected, whilst a third of those who recorded 0·01 gm. and less did become infected.

Details are next supplied of an experiment with moranyl given orally. This experiment which was performed in 1927 has given encouraging results. In view of the importance of dosage, as shown by the previous work, the patients were given, instead of a single dose of 4 gm., 0·08 gm. per kilo in 4 doses of 0·02 gm. All the cases were subject to a very careful preliminary examination. Of the 226 cases dealt with 209 received the four doses and 17 only three. When re-examined 7 months later only 4·8 per cent. of the moranylized were found to be infected, whereas the percentage infected among the non-moranylized was 38.

The author concludes that in moranyl we have a potent prophylactic and adds that it is unfortunate that the drug is so dear.

FOURNEAU, who took part in the discussion following the paper, remarked that, although the price of the drug is very high, this fact should not stop the investigation and that he was convinced that, as the demand increased, the price would fall.

W. Y.

JAMOT (E.) & CHAMBON. Contribution à l'étude du pouvoir préventif du 205 Bayer–309 Fourneau, contre la maladie du sommeil. [**Preventive Power of Bayer 205 against Sleeping Sickness.**]—*Bull. Soc. Path. Exot.* 1930. May 14. Vol. 23. No. 5. pp. 491–499. [1 ref.]

The authors have attempted to confirm the work of BOSSERT that 309 Fourneau has a prophylactic value against sleeping sickness [this *Bulletin*, Vol. 24, p. 959]. His experiment was conducted along precisely similar lines to that of BOSSERT. Certain villages of the Badjoué tribe of the subdivision of Lomié were examined in 1926, and found to be infected to the extent varying from 24·8 to 78·6 per cent. of the population, average 46·5 per cent. The infected were at this visit given a series of six injections of atoxyl. In April, 1928, the district was again visited and the percentage of infected was found to vary from 42·9 per cent. at one village to 63 per cent. at another. The diagnosis was made by blood examination and gland puncture. The number of new cases showed the epidemic to be in full swing.

After this second examination the healthy population was divided into two groups—one group destined to receive the drug and the other to serve as a control. All syphilitics, those suffering from yaws, pregnant women and the old and feeble were excluded. In all, 604 individuals were treated with a prophylactic injection of the drug; 301 received 0·02 gm. per kilo. and 273 were given 0·04 gm. per kilo. The controls numbered 561. It should be added that all the infected in the district were given six injections of atoxyl before the experiment.

Eight months later the population was re-examined. Of the 604 who received the moranyl, 565 were found and of the 561 controls 498. Among the 565 who had been given the drug 174 had become infected (30·7 per cent.) and among the 498 controls 152 (30·5 per cent.).

In a somewhat similar experiment the drug was given by the mouth in doses varying from 2 to 8 cgm. per kilo. Here also the experiment was a failure. The results are set out in detail in a series of tables.

W. Y.

VAUCEL. Traitement de la trypanosomiase humaine par l'atoxyl, la tryparsamide et le 270 Fourneau. Résultats acquis en Afrique Équatoriale française. [**Treatment of Human Trypanosomiasis by Atoxyl, Tryparsamide and Fourneau 270.**]—*Ann. de Méd. et de Pharm. Colon.* 1929. July–Aug.–Sept. Vol. 27. No. 3. pp. 403–415.

Since 1906 atoxyl has been the basal drug for the treatment of sleeping sickness in French Equatorial Africa, but in 1922 tryparsamide began to be tried and subsequently was more and more employed.

Atoxyl. Method of small doses.—As a result of the observations of KOCH in 1907 that too large, or too frequently repeated, doses of atoxyl were apt to produce blindness, the doses at first employed at Brazzaville were very small—0·01 gm. per kilo. of body weight every 7 days. Thus from 1906 to 1920 the patients were treated with weekly doses varying from 0·5 to 0·75 gm. sometimes alone, and sometimes associated with emetic or novarsenobenzol. The results were very unsatisfactory ; cures were not obtained and relapses were common. In 1917 LEBOEUF summarized the results obtained from the use of small doses of atoxyl. Between 1906 and 1917, 2,340 cases of sleeping sickness were under treatment for more or less prolonged periods ; for various reasons 810 could not be followed up. Of the 1,530 kept under treatment and observation 275 (18 per cent.) were discharged, 314 (10·5 per cent. [? 20] were alive and living at home, 458 (30 per cent.) had disappeared and 483 (31·5 per cent.) were dead. Finally, in almost all cases relapses were common and hence the method was of no prophylactic value. These unsatisfactory results caused OUZILLEAU to institute the method of large doses—15 to 20 mgm. per kilo. of body weight.

Method of large doses.—The favourable results attending this method caused it to be generally adopted and the drug was given in two doses of 0·02 gm. per kilo. at ten days' interval and repeated as far as possible each half year. In 1923, BLANCHARD and LAIGRET amplified this method, and proposed to group the injections in series of six at 10 day intervals. This massive dosage could not, however, be given to patients in the later stages of the disease because it produced blindness and other grave symptoms of intoxication. Of the 1,118 patients so treated at Brazzaville between 1920 and 1928, 663 were kept under observation in an adequate manner. The results are summarized in a lengthy table from which it appears that 37·8 per cent. were cured, 36·8 per cent. died, 10·8 per cent. disappeared, and 0·1 per cent. were improved. Limiting the observations to those in the first stage of the disease we find that 60 per cent. were cured, 15 per cent. presented trypanosomes in the blood after treatment, and in 25 per cent. the disease continued its evolution. Among those in the second stage of the disease 0·8 per cent. were cured, 0·4 per cent. improved, 78 per cent. died, and 15 per cent. disappeared.

Tryparsamide.—This drug was first used at Brazzaville in 1922, and was to begin with restricted to patients in the second stage. The patients were divided into the following 4 categories according to the condition of the spinal fluid :—

1st Category.	Lymphocytes 15 to 70. Albumin>0·25<0·50. Nervous symptoms absent.
2nd Category.	Lymphocytes>70. Albumin>0·50. No trypanosomes in spinal fluid.
3rd Category.	Lymphocytes>70. Albumin>0·50. Trypanosomes present in spinal fluid.

4th Category. Lymphocytes>70.
Albumin>0·50.
Trypanosomes present in spinal fluid.
Marked clinical signs : terminal stage.

The first group of cases treated consisted of 95 patients. The course was quite insufficient owing to the difficulty of obtaining supplies of the drug. The immediate results were impressive and the mortality at the hospital in 1925 fell from 36 per cent. to 7·6 per cent.

In 1926, LEDENTU recorded results in 64 patients observed for an average of 15 months after treatment. Details are given in a table : the successes were Category I, 100 per cent., Category 2, 82 per cent., Category 3, 45 per cent., and Category 4, 50 per cent. In 1927, LEDENTU and Vaucel reported on the results of treatment of 165 other cases ; these records are similar to those of LEDENTU.

All these patients were treated with weekly injections of the drug in doses gradually rising from 0·015 to 0·06 gm. per kilo of body weight ; each series consisted of seven injections and was followed by a rest of 45 days. After each series of injections the spinal fluid was examined, and the information thus obtained has suggested the following inferences :—

1. The decline of the lymphocytosis and albumin is constant ; as a result of the first series of injections of about 0·3 gm. per kilo of body weight.
2. The gradual and definite diminution of the albumin alone warrants a good prognosis.
3. The cessation of this decrease and its remaining in the vicinity of 40 per cent. indicates a guarded prognosis, because it is often very difficult to continue the reduction by further series of injections.
4. Further series of injections may, in certain cases, cause the reduction of marked hyper-lymphocytosis and hyper-albumen content ; the cerebro-spinal fluid returning to its primitive abnormal composition or even surpassing it.
5. This may sometimes co-exist with a surprising conservation of the general health, reminding one of a simple toxic meningeal reaction. Then suddenly there appear tremors, spasmodic contractures, epileptiform contractures, etc., and the trypanosomes reappear in the spinal fluid, sometimes even in the course of treatment. Tryparsamide has lost its power and the patient goes steadily down hill.
6. Ocular troubles may appear at any stage of the disease, but are more common in the later cases and in those previously treated with arsenicals. They disappear if the drug is immediately stopped : the dose which provokes them is never less than 0·04 gm. per kilo. The authors have encountered only two cases of complete blindness in all their experience.

Details are given regarding the treatment of 129 cases : Of these, 30·1 per cent. were considered cured, 6·02 improved, 3·01 failures, 6·02 died, 54 per cent. were in such a state as to warrant the hope of a cure, and 0·7 per cent. gave indication of failure. The sense in which these terms are used is defined.

"*Fourneau* 270."—Between 1925 and the end of 1927, 37 patients in the first stage of the disease were treated with this drug. Of these 23 received an adequate course of treatment ; and only one has relapsed 8 months after 0·43 gm. per kilo. Apparently 96 per cent. were permanently cured.

During the same period, 85 cases in the second stage were treated with Fourneau 270. None of them exhibited a blood relapse. The author believes that the dose should never exceed 0·04 gm. per kilo. The action on the meningeal lesions, although manifest, does not appear to be so marked or of such duration as that of tryparsamide.

Of 63 cases in the second stage treated by Fourneau 270 and adequately observed 55 per cent. were cured, 22·2 improved, 7·9 were failures, and 14 per cent. died. Those who died were almost all in the terminal stage of the disease. Amongst the accidents noted were albuminuria, amblyopia and amaurosis. As the result of years of experience the authors recommend the following methods of treatment :—

Patients in the first stage. Fourneau 270 up to an amount of 0·3 gm. per kilo of body weight Failing this drug large doses of atoxyl should be given.

Patients in the second stage. Tryparsamide in doses of 0·015 to 0·035 gm. per kilo. of body weight continued until the spinal fluid becomes normal.

W. Y.

FISCHER (Otto) & KUNERT (Herbert). Untersuchungen ueber die Behandlung der menschlichen Schlafkrankheit mit peroralen Gaben von "Bayer 205." (Vorläufige Mitteilung.) [**Investigations on the Treatment of Sleeping Sickness by Oral Administration of Bayer 205.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1930. May. Vol. 34. No. 5. pp. 252–254. [Inst. for Ship & Trop. Diseases, Hamburg.]

Many cases of sleeping sickness (both new and old) were treated by oral administration of Bayer 205 at the Moravian Mission in Sikonge south of Tabora. The dose given was 2 gm. to 3 gm. repeated until a total of 10 gm. to 12 gm. had been taken within 8 to 10 days. The drug was administered either in solution or in cachets.

The immediate result was excellent ; trypanosomes quickly disappeared from the blood and there was a marked improvement of symptoms. In the great majority of cases, however, a relapse occurred within 6 to 8 days. In view of this, and of the fact that the oral administration was well tolerated, the quantity given was increased to three doses of 4 gm. or 5 gm. each, but the result was the same. A series of observations indicated that a dose of 3 gm. upwards orally caused the trypanosomes to disappear from the blood about as quickly as a dose of 1 gm. given intravenously or intramuscularly.

W. Y.

WALRAVENS (P.). L'émétique par voie buccale dans le traitement des trypanosomiases. [**Tartar Emetic** *per os* **in the Treatment of Trypanosomiasis.**]—*Ann. Soc. Belge de Méd. Trop.* 1930. Mar. 31. Vol. 10. No. 1. pp. 85–86. [Bact. Lab., Elisabethville.]

The author points out that in cases exhibiting optic atrophy and in some infections of *T. rhodesiense* tryparsamide cannot be used ; in such cases combined treatment with Bayer 205, and emetic is very advantageous. Unfortunately, the latter drug is dangerous in the hands of unskilful people and it occurred to the author to ascertain whether it was possible to administer it by the mouth instead of intravenously. It was decided to give the emetic in the form of albuminated pills as recommended by WALKER for the treatment of bilharzia. This form of treatment was tried in three cases of sleeping sickness, but had to be abandoned since the drug was not absorbed sufficiently rapidly to produce peripheral sterilization.

W. Y.

DUBOIS (A.). A propos du mode d'action de la tryparsamide sur les trypanosomes. [**Mode of Action of Tryparsamide on Trypanosomes.**]—*Ann. Soc. Belge de Méd. Trop.* 1930. Mar. 31. Vol. 10. No. 1. pp. 87–94. [6 refs.] [School of Trop. Med., Brussels.]

Atoxyl and arsacetin are trypanocidal only *in vivo* and not *in vitro*, and the same holds true of tryparsamide, another pentavalent arsenical compound. After briefly discussing the two main theories which have been advanced to explain this fact reference is made to the work of LEVADITI, who found, when atoxyl is treated with extract of liver, a substance is formed which is trypanocidal *in vitro*. In the present work Dubois has enquired whether tryparsamide can likewise be activated by treatment with liver extract.

LEVADITI's technique was followed. A guineapig was killed by exsanguination, the liver removed aseptically and ground up with 20 cc. of physiological saline. The liquid obtained was added, either immediately or after standing for an hour, to an equal volume of a 10 per cent. solution of tryponarsyl (Meurice) [Belgian tryparsamide]. The final titre of the arsenical was thus 5 per cent. and less according to its dilution with the trypanosome suspension. The author states that this concentration of tryponarsyl is inactive *in vitro*. The mixture was placed in the incubator for 1½ to 3 hours and sometimes allowed to stand at lower temperatures for some hours longer. The liver extract and solution of tryparsamide served as controls.

The trypanotoxyl was then tested regarding its direct action on a suspension of trypanosomes. The parasites were maintained on the following medium.—Bouillon 100 cc., NaCl 65 cgm., glucose 25 cgm. Experiments showed that in this medium the trypanosomes would remain alive for at least 12 hours. The parasite used was a strain of *T. pecaudi* which in guineapigs and mice was very susceptible to the action of the drug. Whilst the solution of tryponarsyl and the liver extract had no action on the trypanosomes in 2 to 6 hours, the product obtained by the action of liver on tryponarsyl gave evidence of a toxic action in 15 mins. Even with dilutions of 1 : 4 and 1 : 8 the toxic effect was noticeable in 1 hour.

It was found that even when the trypanotoxyl had been kept in the cellar for 15 days it was still active ; and that an alcohol extract could be prepared which would retain, in the dried condition, its activity for at least 5 months.

The spleen, muscles and blood, although acting to some extent on tryponarsyl, were much inferior to liver. Bayer 205, which is inactive *in vitro*, could not be activated by organ extracts.

The author then prepared an arsenic resistant variety of his strain of *T. pecaudi* and on testing this *in vitro* found that it was definitely resistant to his liver tryponarsyl product, whereas when tested against myosalvarsan, it exhibited little, if any difference from the normal strain.

Dubois next attempted to demonstrate the formation of trypanotoxyl *in vivo*. These experiments were of two kinds : in the first, normal and infected guineapigs were injected with 0·5 to 1 gm. of drug per kilo. and sacrificed in 3 to 4 hours and the evidence of the presence of trypanotoxyl sought in the blood and organs ; in the second, the drug was injected into guineapigs containing numerous trypanosomes and the parasites removed after ½ to 2 hours and watched *in vitro*. Both lines of work provided only negative results.

W. Y.

BARLOVATZ (A.). L'arsénorésistance dans la trypanosomiase humaine. [**Arsenic Resistance in Human Trypanosomiasis.**]—*Bull. Soc. Path. Exot.* 1930. Mar. 12. Vol. 23. No. 3. pp. 291–295.

This paper is called forth by the article of VAN DEN BRANDEN [*ante*, p. 228], who denied that arsenic resistance was the true explanation

of the failures obtained by Barlovatz in the treatment of certain cases of sleeping sickness with tryponarsyl [this *Bulletin*, Vol. 26, p. 708] and considered that the failure was due to insufficient dosage.

Barlovatz complains that VAN DEN BRANDEN quite arbitrarily, and as the result of purely personal observation, has fixed the minimum dosage of tryparsamide at 30 gm. ; and points out that many authors have used a total dosage of 25 gm. and some even much less. He recalls that KELLERSBERGER treated 100 patients at Katanga with 25 gm. and obtained 100 per cent. successes. He himself generally gave 4 courses of 24 gm., and more for very advanced cases ; the average quantity given to a patient was over 100 gm.

The " arsenic-resistant " cases recorded in the author's previous paper received on an average 38 gm. of tryponarsyl, which VAN DEN BRANDEN referred to as puerile. Barlovatz states that the medical man working in the field could not possibly give 200 gm. of tryparsamide in interrupted courses to patients with altered spinal fluid. It is of more interest to know what proportion of successes can be obtained with the most modest treatment that it is practicable to give. VAN DEN BRANDEN is mistaken when he attributes to his own observations an absolute value. The percentage of successes varies greatly in different countries even though the same treatment be given.

Cases of arsenic-resistance are undoubtedly rare, the author having encountered to the end of 1928 only about 50 among 4,000 patients. In the autumn of 1929, whilst re-examining a zone containing 600 cases some 8 months after the previous examination, the author encountered 6 cases with gland relapses. One of these patients who had been quiescent since 1926 was set aside. The remaining five, who had all received recent courses of tryparsamide terminating respectively 6 days, 10 days, 1 month, 4 months and 5 months previously, were all given 90 cgm. of rhodarsan (914) and then one or two doses of 2 gm. of tryparsamide. In one patient the 914 caused a temporary disappearance of the parasites, but the others were not sterilized. This fact caused the author to substitute non-arsenical drugs, viz., emetic and germanin.

Barlovatz states that he does not doubt that tryparsamide gives a greater proportion of successes than any non-arsenical preparations, but he maintains that when it fails in a patient it is useless to persist with it. During 1926 and 1927 he has treated many patients with prolonged courses of tryparsamide, notwithstanding the fact that the glands were not sterilized, and has seen them pass into the second stage of the disease. In such cases the combination of emetic and germanin alone arrested the progress of the disease.

The author states that he is unable to subscribe to the statement of VAN DEN BRANDEN that Bayer 205 and atoxyl are incapable of producing a cure of patients in the second stage of the disease. He cites instances of such cases and also of cases in the second stage apparently cured by emetic and germanin.

In conclusion Barlovatz considers that in the Mayumbe district at least " arsenic resistance " is a definite phenomenon which has to be reckoned with in the treatment of sleeping sickness and which indicates the necessity in certain cases of combining with tryparsamide, or of substituting for it, some non-arsenical preparation.

W. Y.

ARNAUD (R.). Au sujet de l'arsénorésistance de la trypanosomiase humaine. [**Human Trypanosomiasis and Arsenic Resistance.**]—*Bull. Soc. Path. Exot.* 1930. May 14. Vol. 23. No. 5. pp. 461–463.

The author has read with interest the recent polemic between BARLOWATZ and VAN DEN BRANDEN [see above], and as one who works in the bush, he desires to reply to the article of BARLOWATZ. He considers that the truth of arsenic-resistance nobody will deny—no one less than VAN DEN BRANDEN. It is not without reason that VAN DEN BRANDEN has laid down that the minimum course of tryparsamide should be 30 gm. He agrees with BARLOWATZ that many cases have been cured with less amounts of the drug, but such cases are exceptional. Arnaud cannot agree that it is impossible for a medical mission in the field to administer the dose recommended by VAN DEN BRANDEN and states that in the field in which he labours such courses are habitually given. He works under conditions which are probably more precarious than those obtaining in the Belgian Congo, but he finds no difficulty in keeping the patients in the treatment centre provided they are well fed and lodged and properly looked after.

BARLOWATZ'S statement that patients with altered spinal fluid can be sometimes cured with atoxyl is news to the author; he has not seen any such cases. He is also astonished at the doses of moranyl employed by BARLOWATZ; doses of 10 to 20 gm. in his hands produced renal and other disturbances. The paper concludes with the opinion that the question of arsenic-resistance is a very important one and that, notwithstanding his criticisms, BARLOWATZ has done well to raise a matter of such practical interest.

W. Y.

VAN DEN BRANDEN (F.). L'etharsénol et le proparsénol dans le traitement de la trypanosomiase humaine. [**Etharsanol and Proparsanol in the Treatment of Human Trypanosomiasis.**]—*Ann. Soc. Belge de Méd. Trop.* 1930. Mar. 31. Vol. 10. No. 1. pp. 1–23. [2 refs.] [Leopoldville Lab., Leopoldville, & School of Trop. Med., Brussels.]

The author has tested the therapeutic value in cases of human trypanosomiasis of two new pentavalent arsenicals—etharsanol and proparsanol—obtained from STRATMAN-THOMAS of Wisconsin [this *Bulletin*, Vol. 26, p. 199]. Although nothing definite was known regarding posology, the dose recommended was 1 to 2 gm. for an adult; both products are soluble in water and 10 to 20 per cent. solutions were used for intravenous injections.

Etharsanol. As in the case of tryparsamide an injection of 2 gm. produced peripheral sterilization within a few hours. The duration of this sterilization in one patient was 35 days. Of the 27 cases treated with this drug 6 had a normal spinal fluid. In one of the patients visual disturbance appeared after 8 gm. had been given, and in a second case the treatment had to be stopped after the administration of 30 gm. for a similar reason. One patient in the first stage of the disease appeared to be cured by 22 gm., and in two others also in the first stage peripheral sterilization appeared to be permanent and the spinal fluid to remain normal after respectively 20 gm. and 32 gm. of the drug. One case relapsed three months after a course of 20 gm.

The remaining 21 chronic cases had not previously received any treatment. Of these, unfortunately, 12 exhibited ocular troubles after they had

received doses varying from 20 gm. to 56 gm. of the drug. Details are given of all 27 cases.

Proparsanol. As the quantity of this drug was limited he was unable to give a sufficiently long course and was obliged to continue the treatment with etharsanol. Twelve chronic cases were treated with the drug, the total amount given being 20 gm. for an adult and 10 gm. for an adolescent. In one case the lymphocytosis in the spinal fluid increased from 14·2 to 15·2 per cmm. after the administration of 13 gm.; but in all the other cases there was a diminution both of the lymphocytes and of the albumin. Here again a number developed visual disturbance. Details of the cases treated are given.

The general conclusion reached is that although the therapeutic power of these drugs is of the same order as that of tryparsamide, the fact that they readily produce optical disturbance must prevent their use in the treatment of human trypanosomiasis. W. Y.

GIEMSA (G.). Ueber chemotherapeutische Studien mit einer neuen, für die Behandlung der Schlafkrankheit und anderer Trypanosen aussichtsreichen Benzolarsinsäure ("Arsenpräparat 4002"). [**Chemotherapeutic Studies with a New Benzol Arsinic Acid "Preparation 4002."**]—*Beihefte z. Arch. f. Schiffs- u. Trop.-Hyg.* 1929. Vol. 33. No. 3. pp. 130–142 (214–226). [13 refs.]

The drug is crystalline, colourless, odourless and tasteless and can be either injected or given orally. It is well tolerated in large doses by men and large animals, and mice can be given 100 mgm. subcutaneously and 200 mgm. orally. For infected mice the chemotherapeutic index is from 1 : 10 to 1 : 16, as compared with tryparsamide 1 : 2 and atoxyl 1 : 1. The drug clears the blood of mice with remarkable rapidity: in many infections the parasites have disappeared from the peripheral blood within 20 minutes.

A few preliminary clinical trials have been conducted on cases of sleeping sickness in the Cameroons. Five old standing cases [lumbar puncture was not performed] were treated with "4002." One of these patients had not previously been given any treatment, but the other 4 had had five injections of tryparsamide ten months previously and had relapsed. In all, five trypanosomes were found at the time of treatment in the gland juice or blood. The drug was given in 10 per cent. solution intravenously, two patients receiving 1 gm. and the other three 1·5 gm. In four the injection was repeated after an interval of a week. In all cases the trypanosomes had disappeared within 24 hours and there was no relapse within the observation period (8 to 13 days). W. Y.

i. LAUNOY (L.) & ENGLER (A.). Eléments pour servir à l'étalonnage de quelques composés arsenicaux pentavalents à pouvoir trypanocide. [**Data for Standardization of the Trypanocidal Effects of Certain Arsenical Compounds.**]—*C.R. Soc. Biol.* 1930. May 9. Vol. 104. No. 15. pp. 66–68.

ii. —— & ——. Etalonnage des composés arsenicaux pentavalents d'après une unité trypanocide choisie. [**Standardization of Pentavalent Arsenical Compounds based on a Chosen Trypanocidal Unit.**]—*Ibid.* pp. 69–71.

i. The data furnished in this paper were obtained with the object of comparing the pentavalent arsenicals, atoxyl, tryparsamide and orsanine

(270 Fourneau). In two tables the toxicity of each of these compounds, when administered intravenously, is given for the rabbit and mouse. In these tables the dose which is lethal in 100 per cent. of cases is given, as is also the minimal lethal dose; the authors write that between these two extremes all sorts of intermediate results are obtained and they record two of them, viz., the dose exceptionally supported and the dose tolerated by 50–60 per cent. of animals. In a third table the curative dose for mice infected with *T. brucei*, *T. evansi* and *T. equiperdum*, respectively, is given. The mice were treated 24 to 48 hours after infection with *T. brucei* or *T. evansi* and 48 hours after infection with *T. equiperdum*. The curative dose, which is calculated per 20 gm. of mouse, is considered to be that which prevented relapse for 30 days in 90 to 100 per cent. of the mice. The table brings out the interesting fact that whilst this dose is, in the case of orsanine, constant (3 mgm.) for each of the three infections, it varies somewhat in the case of atoxyl and tryparsamide according to the infection. The expression "dose trypanocide trivalente" is used for that dose which would apply to all of the three infections.

From the data thus obtained the authors proceed to calculate the coefficient of experimental trivalent trypanocidal activity, i.e., a fraction consisting of the trivalent curative dose as the numerator and the dose tolerated by 60 to 50 per cent. of animals as the denominator $\frac{\text{D.C. tr.}}{\text{D. tol. 60–50}}$. For atoxyl this was found to be 1/1·4, for tryparsamide 1/4·1, and for orsanine 1/8·3.

ii. Since the three drugs in question are not of the same molecular weight, the coefficient given above does not allow of their comparison. The authors have, however, devised a method whereby it is possible to obtain a comparison. They have taken atoxyl as the standard. Assuming 5 mgm. is the trivalent trypanocidal dose of this drug, it is possible to transform, in order to compare their value, the results obtained with the other products into units of "trypanocides trivalentes-atoxyl." Atoxyl with 4 molecules of water has a molecular weight of 311, tryparsamide with ½ mol. of water 305, and orsanine with 5 mols. 387. From this it follows that 1 gm. mol. gm. of atoxyl equals 0·98 gm. mol. gm. of tryparsamide, and 1·24 gm. mol. gm. of orsanine. On this basis the equal trivalent trypanocidal doses would be atoxyl 0·005 gm., tryparsamide 0·0142 gm. and orsanine 0·00241 gm.

The numbers can be compared with one another and one can say that: 1 gm. mol. gm. of atoxyl contains in atoxyl 200 trivalent trypanocidal mouse units; 1 gm. mol. gm. of tryparsamide 70 units; and 1 gm. mol. gm. of orsanine 418 units. From this it follows that if we represent the trypanocidal power of atoxyl as 1, then that of tryparsamide will be 0·35 and that of orsanine 2·07.

W. Y.

i. LAUNOY (L.) & PRIEUR (M.). Premiers résultats relatifs à l'étude du mécanisme de l'action trypanocide du 205 Bayer-309 Fourneau. [**Study of Trypanocidal Action of Bayer 205-Fourneau 309.**]—*C.R. Soc. Biol.* 1930. Feb. 21. Vol. 103. No. 7. pp. 478–481. [3 refs.]

ii. —— & ——. Résistance de *Trypanosoma brucei* au 205 Bayer-309 Fourneau chez le lapin et avirulence pour la souris. [**Resistance of *T. brucei* to Bayer-Fourneau in the Rabbit and Non-Virulence for Mice.**]—*Ibid.* pp. 481–483. [1 ref.]

i. Earlier work on the mechanism of the trypanocidal action of 205 Bayer-309 Fourneau has evoked two hypotheses, viz.: the cellular theory and the humoral theory. The former, which was evolved by MAYER and ZEISS and supported by many other workers, postulates

that the drug renders the parasites incapable of division ; consequently, the trypanosomes are avirulent when transferred from a treated animal to another. Certain work of BRUMPT on *T. inopinatum* threw doubt on the correctness of this hypothesis. The authors recall that MAYER and ZEISS, and NAUCK, used massive doses of the drug in their experimental work ; they believe that a clearer insight into the mechanism of the action of the drug would be obtained from the use of liminal doses.

Details are given of four experiments—two with rabbits, one with a cat and one with mice—in which the animals were infected with *T. brucei* and then treated with small doses of Bayer 205 ; at intervals varying from a few minutes up to 24 hours after treatment subinoculations were made into mice.

The following are the conclusions :—

1. The injection of liminal doses of Bayer 205 into infected rabbits or cats very rapidly renders the virus avirulent for mice. This avirulence for mice may co-exist with multiplication of the parasites in the treated rabbit or cat.

2. The blood of infected mice, treated by liminal sterilizing doses of Bayer 205, remains virulent for animals of the same species, up to the time when parasites can no longer be detected in the blood.

3. The action of Bayer 205 on the reproductive capacity of the parasites (anti-schizogony) does not, even if it exists, seem to be an essential character. It does not appear to be necessary and in any case it alone does not suffice to explain the trypanocidal action of the drug.

4. The trypanosomes transferred from mice treated with Bayer 205 to healthy mice are not resistant to the drug.

5. The infection of fresh mice with *T. brucei* rendered avirulent for the mouse by the injection of Bayer 205 into infected rabbits or cats does not cause the mice to be immune to a virulent strain of *T. brucei*.

ii. In the course of the work on the mechanism of the trypanocidal action of Bayer 205, the authors encountered an instance of resistance of the virus to the drug. A rabbit, infected with *T. brucei*, was given shortly afterwards a dose of 0·05 gm. per kilo. of Fourneau 309. Five hours later parasites (1–10 fields) were still seen in the blood ; two mice were subinoculated with negative results. For the next 10 days the blood was negative ; on the eleventh day there was a relapse and on the sixteenth day 5 or 6 parasites were seen to a field ; 4 mice were inoculated, again with negative results. Two days later 8–10 parasites were seen to a field and three more mice were inoculated also with negative results ; approximately the same state of affairs was encountered on the twentieth day, parasites being seen in the blood in considerable numbers, but failing to infect when inoculated into mice. On this day the rabbit was given a second dose of 0·05 gm. per kilo. of Fourneau 309. This, however, failed to cause the disappearance of trypanosomes from the rabbit's blood, but subinoculations of the parasites into 3 mice and a rabbit failed to infect. Further details are given.

The authors believe that this observation supports the third conclusion of their previous note, viz., that the trypanocidal action of Bayer 205 cannot be explained solely by its action on the reproduction processes of the parasites. W. Y.

LAUNOY (L.), NICOLLE (P.) & PRIEUR (M.). Recherches sur la thérapie et la prévention du nagana expérimental de la souris et du chat avec le 205 Bayer-309 Fourneau. [**Treatment and Prevention of Experimental Nagana in Cat and Mouse with Fourneau 309.**]—*Bull. Soc. Path. Exot.* 1930. June 11. Vol. 23. No. 6. pp. 630–640. [2 refs.]

It was found that Fourneau 309 exerted a definite prophylactic action in cats against infection with *T. brucei* : this action was in some degree related to the dose of the drug given, but the duration of the refractory state in the

cat was not arithmetically proportionate to the dose. For example, it was found that after 0·02 gm.per kilo. the protection lasted 79 to 140 days and after a dose of 0·04 gm. per kilo. 157 days. From these facts it is concluded that if the dose chosen be 0·02 gm., the protection injection should be repeated every 60 to 90 days and if the dose be 0·04 gm. every 90 to 150 days.

W. Y.

COLLIER (W. A.) & KRAUSE (Magdalene). Zur Abortivheilung der Schlafkrankheitsinfektion der weissen Maus. [**Abortive Cure of Sleeping Sickness Infection of White Mice.**]—*Ztschr. f. Hyg. u. Infektionskr.* 1930. Apr. 17. Vol. 111. No. 2. pp. 191–197. With 1 text fig. [5 refs.] [Robert Koch Inst., Berlin.]

As the result of his chemotherapeutic investigations, EHRLICH observed that in the occurrence of a chemotherapeutic cure besides the direct influence of the parasite the mobilization of the defensive power of the organism can play an important part. A portion of the parasites is first killed by the chemical, and the free antigen thus formed stimulates the immune-body-forming organs of the infected animal, a process which EHRLICH designated "Ictus immunisatorius."

KOLLE (1922) working with rabbit syphilis showed that during the first weeks after infection it was possible to produce sterilization by means of salvarsan treatment, but that later, as the result of changes in the reaction capacity of the body, the most intensive treatment either with salvarsan alone, or in combination with bismuth or mercury, failed to produce a lasting cure.

The authors considered it to be of interest to ascertain whether this phenomenon was encountered in other infections; especially as EHRLICH had found that in recurrent fever infection of mice a cure was obtained with smaller doses of salvarsan at the height of the infection than at the beginning—an observation which was subsequently confirmed by FELDT. *T. gambiense* infection of white mice appeared to the authors a particularly favourable infection to work with from this point of view. The strain used came from Hamburg and killed untreated mice in 4 to 6 weeks. A large series of mice was infected by intraperitoneal injections of similar quantities of the virus and then divided into two groups. The first was treated on the 3rd day and the second on the 14th day. The drug employed was B R 34a [*ante*, p. 232]. The preparation was suspended in olive oil and dilutions varying from 1/1,000 to 1/10,000 in 1 cc. were given per 20 gm. mouse. The blood of the mice was then carefully examined for relapses, and the results of the two series of experiments are set forth in tables.

It was found that if the animals were treated on the 3rd day of the infection 1/4,000 always cured, and 1/5,000 and 1/6,000 sometimes, whilst in those treated on the 14th day a concentration of 1/1,000 was necessary to produce a certain cure and 1/2,000 only cured sometimes.

W. Y.

COLLIER (W. A.). Ueber die Wirkung der unlöslichen Arseno-Pyridinverbindung B R 34a auf die chronische Trypanosomeninfektion der weissen Maus. [**The Action of the Insoluble Arseno-Pyridin Compound B R 34a on Chronic Trypanosome Infections in White Mice.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1930. May. Vol. 34. No. 5. pp. 254–258. [6 refs.] [Robert Koch Inst., Berlin.]

Reference is made to the fact that Collier and KRAUSE [*ante*, p. 232] have already demonstrated the favourable action of this drug in *T. brucei* infec-

tions in mice. The drug was prepared by BINZ and RAETH and called by them B R 34a; it is an insoluble arseno-pyridin compound and closely allied to their preparation B R 34, the therapeutic action of which has already been reported upon by DAHMEN, GIEMSA and MAYEDA, and KLEINE [this *Bulletin*, Vol. 25, p. 346].

It was found that B R 34a had no action on *Schiz. cruzi.* infections. Against *T. gambiense* infections in white mice it was, however, extraordinarily active. Subcutaneous injections of 1/4,000 of an olive oil suspension always cured the mice and 1/5,000 sometimes; this gave a chemotherapeutic quotient of 1/40 to 1/50.

W. Y.

WRIGHT (Harold N.) & HIRSCHFELDER (Arthur D.). **Studies on the Colloid Chemistry of Antisepsis and Chemotherapy. IV. The Duplication *in vitro* of the "Interference Phenomenon" in Combination Chemotherapy.**—*Jl. Pharm. & Experim. Therap.* 1930. May. Vol. 39. No. 1. pp. 39–57. With 4 text figs. [17 refs.] [Pharmacol. Dept., Univ. of Minnesota, Rochester.]

The gist of the material contained in this article has been published elsewhere and noticed in this *Bulletin* [*ante*, p. 234]. In the present paper a full account is given of the experimental work upon which the argument is based.

The following are the conclusions :—

"1. The interference of acriflavine against the trypanocidal action of triphenyl methane dyes observed by Browning and Schnitzer in animals, a phenomenon of "drug-fastness," can be duplicated *in vitro* upon the CO_2 production of yeasts.

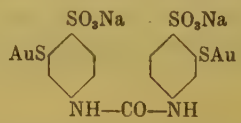
"2. This reaction appears to be a phenomenon due to adsorption of the first dye upon the surface of the cell interfering with the adsorption of the second.

"3. This analogy should furnish a means for studying further questions of drug-fastness and for further physicochemical investigation of many questions in chemotherapy."

W. Y.

FISCHL (Viktor). Ueber eine trypanozide Goldverbindung. [**On a Trypanocidal Gold Compound.**]—*Zent. f. Bakt.* I. Abt. Orig. 1930. Feb. 3. Vol. 115. No. 5/6. pp. 383–386. [9 refs.] [Psychiat.-Neurol. Clinic, Univ., Heidelberg.]

This note deals with the toxic and therapeutic value of a new organic thiogold compound of the following formula :—



„Sulfo-Harnstoff"
Dinatriumsalz des 4,4'-Bis-
(2-auromerkaptobenzol- 1-sulfosäure)-harnstoffs

Its therapeutic action was tested on mice infected respectively with *Trep. recurrentis* and *T. brucei*. The therapeutic index for the spirochaete infection was found to be 1 : 16 and that for the trypanosome infection 1 : 2.

W. Y.

i. LEVINSON (L. B.) & ROMANOWA (K. G.). Arzneimittel und ultraviolette Strahlen. V. Mitteilung. Zur Analyse der kombinierten Wirkung des Novarsolans und ultravioletten Strahlen auf Trypanosomen. [**Analysis of the Combined Action of Novarsolan and Ultraviolet Rays on Trypanosomes.**]—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1930. Vol. 66. No. 1/2. pp. 141–148.

ii. ROSKIN (Gr.), BICHOWSKAJA (A.) & SCHISCHLIAIEWA (S.). VI. Mitteilung. Die kombinierte Wirkung der ultravioletten Strahlen und einer Reihe von trypanoziden Stoffen auf Trypanosomen. [**Combined Action of Ultraviolet Rays and a Series of Trypanocidal Substances on Trypanosomes.**]—*Ibid.* Vol. 67. No. 1/2. pp. 91–94. [2 refs.]

iii. —— & ROMANOWA (K.). VII. Beitrag zur Analyse der kombinierten Wirkung von Salvarsan und ultravioletten Strahlen bei Protozoeninfektionen. [**Analysis of the Combined Action of Salvarsan and Ultraviolet Rays in Protozoal Infections.**]—*Ibid.* pp. 94–101. [Microbiol. Research Inst., Education Commissariat R.S.F.S.R. Moscow.]

i. Reference is made to the previous work of ROSKIN and Romanowa and of ROSKIN and Levinson [*ante*, p. 233] that the therapeutic action of salvarsan is increased by subjecting the animal to the influence of ultraviolet rays. The authors have now enquired whether, in order to produce this increased action, it is necessary to apply the rays after the administration of the drug to the infected animal, or whether the application of the rays before the administration of the drug also leads to an increased action of the latter. The conclusions are :—

1. The application of ultraviolet rays to an animal infected with *T. equiperdum* or *T. gambiense* exerts no influence on the infection.

2. The radiation of mice infected with *T. equiperdum* before treatment with novarsolan increases neither the therapeutic nor the sterilizing action of the drug.

ii. In further experiments the authors used, instead of salvarsan, germanin and tartar emetic. They obtained with these drugs negative results and conclude that the phenomenon which is only seen with salvarsan is due to an action of the ultraviolet rays on this drug in the animal body.

iii. It was found that the serum of mice which had been subjected to ultraviolet rays possessed, when mixed with subcurative doses of neosalvarsan, the capacity of so altering the drug as to render the doses curative. The serum of the exposed mice alone exerted no influence on the course of the trypanosome infection. W. Y.

GIEMSA (G.) & ELLENBOGEN (V.). Die kombinierte Wirkung ultravioletter Strahlen und Neosalvarsan auf *Trypanosoma equiperdum*. [**Combined Action of Ultra-Violet Rays and Neosalvarsan on** *T. equiperdum*.]—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1930. Vol. 67. No. 1/2. pp. 78–82. [Inst. for Ship & Trop. Diseases, Hamburg.]

The authors were unable to confirm the statement recently made by ROSKIN and ROMANOWA [*ante*, p. 233] that the application of ultraviolet rays to an infected mouse greatly increased the therapeutic activity of small doses of neosalvarsan. W. Y.

CHAGAS. Sur les altérations du coeur dans la trypanosomiase américaine (maladie de Chagas). [**Cardiac Changes in American Trypanosomiasis.**]—*Arch. Malad. du Coeur.* 1928. Vol. 21. pp. 641–655. With 8 text figs. & 12 plates following p. 704.

The author describes the cardiac lesions he has met with in the acute and chronic stages of the disease which bears his name. In the acute stage there is an intense and diffuse myocarditis with mechanical and toxic destruction of the fibres and an abundant infiltration of the

interstitial tissue ; macroscopically there is a moderate dilatation of the cavities and a diminution of consistency. In the chronic stage the myocarditis is especially interstitial : there is a hyperplasia of fibrous tissue and cellular infiltration. Sometimes the fibrosis and infiltration are found in the same focus, but zones showing exclusively hyperplasia and others only infiltration are not uncommonly met with. This specific myocarditis is specially characterized by its extension throughout the entire myocardium. No lesions are to be found in the valves or coronary vessels. In the chronic stage there is always considerable increase in size of the heart, with dilatation of the cavities, but only slight hypertrophy of the walls.

The author next passes to a description of the clinical signs produced by these lesions.

Symptoms, subjective and objective.—In the acute stage of the disease the cardiac alterations are ill-defined and indicated solely by enfeeblement of the organ, without the marked alterations of rhythm characteristic of the next stage. In the chronic stage the symptoms are dependent on the intensity of the inflammatory processes. To begin with signs of circulatory insufficiency are absent, but physical examination reveals functional changes in the heart. As the disease advances the cardiac symptoms become more marked : the patient becomes fatigued, there is intense dyspnoea on effort ; vertigos and palpitations are frequent and these are accompanied by vague precordial pains. The following are among the more salient physical signs—enlargement of the heart, discrete oedemas, greatly reduced arterial tension and arhythmia.

Alterations of the cardiac rhythm.—This in its various forms constitutes the outstanding symptom of the disease. The types of arhythmia are to be correlated with the functional alterations.

The author discusses these various conditions and illustrates his observations by electrocardiograms.

Evolution of the cardiac form.—This depends on the intensity and extension of the inflammatory process, and also upon the site of the lesions, e.g., whether these are in regions of greater or less functional importance. There is reason to believe that the lesions develop more rapidly in the ventricles because it is there that one encounters the initial alterations of rhythm. The morbid processes seem to be later in the auricles and to develop more slowly.

Death in American trypanosomiasis. Death may supervene from progressive asystole, or suddenly. The former undoubtedly occurs more frequently, but the latter event is very interesting. In regions where trypanosomiasis is endemic it is rarely that patients when questioned do not mention cases of sudden death in their family history. The paper ends with a discussion of various hypotheses which have been advanced to explain the mechanism of sudden death in this disease.

W. Y.

CHAGAS (Evandro). Estudo electro-cardiographico na fórma cardiaca da trypanosomiase americana. [**Electrocardiogram Study in the Cardiac Form of American Trypanosomiasis.**]—*Folha Med.* 1930. Mar. 25. Vol. 11. No. 9. pp. 97–99. With 11 text figs. [Oswaldo Cruz Hosp., Rio de Janeiro.]

This is a most interesting study of the cardiac irregularities occurring in 35 cases of Chagas's disease. The commonest were disturbances of

ventricular rhythm (in 34), extrasystoles and auricular disturbance next (31 each), dissociation of auriculo-ventricular cycle (11); less common is sinus arhythmia, and auricular fibrillation was observed once only. These symptoms are due to localization of the parasite in the musculature of the heart, either interfering with conductivity or increasing excitability. The mortality is very high; sudden death occurred in twenty-seven and was most likely to take place in those with ventricular arhythmia and extrasystole, not in those with heart-block. [The reproductions of the cardiographic tracings are unfortunately too hazy and too much reduced to convey much information.]

H. H. S.

CHAGAS (Evandro). Estudo electro-cardiographico na fórma cardiaca da trypanosomiase americana. [**Electrocardiographic Study of Cardiac Forms of American Trypanosomiasis.**]—*Folha Med.* 1930. Apr. 5. Vol. 11. No. 10. pp. 113–115. With 8 text figs. [Oswaldo Cruz Hosp., Rio de Janeiro.]

Further notes on the conditions of arhythmia occurring in Chagas's disease are given, in particular the ventricular forms, with cardiographic tracings.

H. H. S.

REGENDANZ (P.). Der Verlauf der Infektion mit *Schizotrypanum cruzi* (Chagas) bei jungen Ratten und ueber die Unempfänglichkeit erwachsener Ratten für Schizotrypanum. [**The Course of** *T. cruzi* **Infection in Young Rats and the Insusceptibility of Adult Rats to this Infection.**]—*Zent. f. Bakt.* I. Abt. Orig. 1930. Apr. 26. Vol. 116. No. 4/5. pp. 256–264. [4 refs.] [Inst. for Ship & Trop. Diseases, Hamburg.]

Experiments showed that whilst adult rats are insusceptible to *T. cruzi*, young animals are readily infected during the first weeks of life. An account is given of the course of the infection in young rats; the incubation period is 7 to 13 days. The younger the animal the heavier, as a rule, is the blood infection and the longer its duration.

From the seventh to the eighth week onwards parasites can no longer be found in the blood, no matter at what age the rat was infected or what was the original degree of infection. The infection ends fatally in 25 per cent. of young rats, or the parasites may disappear from the blood and apparently the infection dies out.

The course of the infection in rats corresponds closely with the acute form of Chagas's disease; and similarly the insusceptibility of adult animal corresponds with that of older children and adult human beings.

The serum of adult rats has no protective action. Neither the castration of adult rats nor the implantation of the testes of adult rats into young rats or mice exerts any influence on the susceptibility to infection. Similarly splenectomy of adult rats does not make them susceptible.

W. Y.

MAZZA (Salvador). Acerca de la infección espontánea de la mulita en el norte por el "Tripanosoma cruzi." (Nota preliminar.) [**Spontaneous Infection of the Armadillo in the Northern Argentine by** *Trypanosoma cruzi.*]—*Prensa Méd. Argentina.* 1930. Jan. 30. Vol. 16. No. 24. pp. 1171–1173. With 1 text fig. [6 refs.]

In spite of the large number of human cases of infection by *T. cruzi* no animal reservoir host has been discovered. The author found a certain species of armadillo, *Dasypus hybridus*, of which several are present in the Northern Argentine (*D. novemcinctus*, *D. velerosus* and *D. hybridus*), to be harbouring the trypanosomes. Four years ago he found a dog naturally

infected. Attempts to make *Triatoma infestans* bite *D. hybridus* have failed, but another species, *T. geniculata*, has been found to transmit the infection from one of these animals to another, according to observations made in Brazil.

H. H. S.

MAZZA (Salvador). Acerca de la infección espontánea de la mulita por el "Trypanosoma cruzi" en el Norte Argentino. Comprobación en el miocardio y pulmón de los "Gigantocitos quísticos" de Magarinos Torres. (Segunda nota preliminar.) [*T. cruzi* **in Armadillo. Cystic Gigantocysts of Torres in Myocardium and Lung.**]—*Prensa Méd. Argentina.* 1930. June 10. Vol. 17. No. 1. pp. 49–54. With 11 text figs. [5 refs.]

In December, 1929, the author found an armadillo (*Dasypus hybridus*), one of 80 such animals examined, spontaneously infected with *T. cruzi*. At the time of capture 3 or 4 trypanosomes were seen in each field of a blood smear; the number increased for 5 days, after which they diminished and 10 days later none was found. *Acanthocheilonema tatusi*, adult and embryos, were present in the same animal, which was killed on January 2nd, 1930, and the tissues were sectioned. The trypanosomes, though absent from the general circulation, were seen in the myocardium, one lung and the thigh muscles, not elsewhere. "Cystic gigantocytes" which had been recorded by TORRES in a *Dasypus novemcinctus* spontaneously infected were looked for and found in the heart and the muscle fibres of the bronchi. These are large cells, up to 80 microns long by 15–16 wide, containing many leishmanial forms arranged around the nucleus, which has a ring shape and within it is a clear space containing no parasites. Seeing that parasites had disappeared from the circulating blood, and inoculation may also fail, it is not possible to declare an animal uninfected without microscopical examination of the tissues.

H. H. S.

GIORDANO (Mario). Sulla possibilità di infettare il *Triatoma flavida* con il *Trypanosoma cruzi*. [*Triatoma flavida* **as a Possible Vector of** *Trypanosoma cruzi*.]—*Arch. Ital. Sci. Med. Colon.* 1930. Apr. 1. Vol. 11. No. 4. pp. 193–195. With 2 text figs. English summary (5 lines). [Inst. of Trop. Path., Univ., Bologna.]

In addition to the known reduviid bugs which transmit *T.cruzi* in nature, there are several which can be experimentally infected; seven are specifically mentioned. *Triatoma flavida* is found in Cuba, but Chagas's disease is not seen. Eggs were sent by Professor HOFFMANN from Habana to the author, who without difficulty was able to infect the bugs with *T. cruzi* and in them development proceeded as in *T. megista* or *Rhodnius prolixus*. Should the disease be introduced from America to Cuba, as is not unlikely, *Triatoma flavida* being present furnishes conditions favourable to its spread.

H. H. S.

i. CAMPOS (Ernesto de Souza). Alteraçoes pathologicas do tecido adiposo na molestia de Chagas congenita experimental. [**Pathological Changes in the Adipose Tissue in Congenital Trypanosomiasis of the Dog. Experimental Chagas' Disease.**]—*Bol. Biol.* 1929. Dec. 20. No. 16. pp. 75–77. With 3 figs. [3 refs.] [In Portuguese. English summary.]

ii. ——. Corpos intranucleares nas cellulas do reticulo endothelial do ganglio lymphatico parasitado pelo *Trypanosoma cruzi*. Nota previa. [**Intranuclear Bodies in Experimental Trypanosomiases of Dogs (Chagas' Disease).**]—*Ibid.* pp. 99–100. With 2 figs. [In Portuguese. English summary.] [Microbiol. Lab., Faculty of Med., S. Paulo.]

i. In a case of congenital trypanosomiasis (*T. cruzi*) of a two months old puppy, the author observed pathological changes in the fat areolar tissue

around the kidney and especially suprarenal bodies. Numerous parasites were found in the loose connective tissue and inside the fat cells. The small amount of cytoplasm constituting the wall of these cells was filled with the parasites. The loose connective tissue exhibited a marked myeloid formation. There were also numerous lesions associated with the presence of parasites in the other tissues of this puppy, i.e., brain, spinal cord, lymph glands, kidneys, adrenals, and so forth.

ii. It was observed that in the swollen lymph nodes of puppies infected with *T. cruzi* there was a proliferation of the reticulo-endothelium, some of the cells of which contained numerous parasites. The nuclei of these cells exhibited characteristic changes which are similar to those caused by filterable viruses. Round, oval, or even slightly irregular masses staining very well by different methods are seen in the central part of the nucleus. The nucleus becomes vesicular in character, so that there is a definite space between the central body and the limiting membrane, which is stained deeply with basic dyes. Usually the inner surface of the membrane is irregular as though the basic staining material were collected there. The central body stains deeply.

W. Y.

GALLIARD (H.). Infections à *Trypanosoma cruzi* chez les animaux splénectomisés. [*T. cruzi* **Infections in Desplenated Animals.**]—*Bull. Soc. Path. Exot.* 1930. Feb. 12. Vol. 23. No. 2. pp. 188–192. [17 refs.] [Parasit. Lab., Faculty of Med., Paris.]

The author found that neither inoculation of *T. cruzi* into splenectomized animals nor the removal of the spleen during infection exercised any influence on the evolution of the disease.

W. Y.

GALLIARD (H.). Localisation péritonéale exclusive au cours de certaines infections à *Trypanosoma cruzi* chez la souris. [**Peritoneal Localization of** *T. cruzi* **in Mice.**]—*Ann. Parasit. Humaine et Comparée.* 1930. Mar. 1. Vol. 8. No. 2. pp. 140–142. [1 ref.] [Parasit. Lab., Faculty of Med., Paris.]

The author refers to his previous paper. [*ante*, p. 246] in which he pointed out the occurrence of an early and constant localization of parasites in the peritoneal cavity of mice infected with *T. cruzi*. He now records further observations on this subject. He writes that in the course of the development of certain *T. cruzi* infections in the mouse, the occurrence of parasites in the blood is always scanty and irregular, and sometimes non-existent, even in the terminal period. On the contrary, the peritoneal localization is constant, progressively increasing and finally causing death. Oedema of the thoracic and abdominal walls and the presence of trypanosomes in the subcutaneous fluid are more constant than was previously thought. The peritoneal infection disappears only in exceptional circumstances, which will be indicated later. It is sometimes retarded when there is contamination at the time of inoculation. The subcutaneous route is preferable in view of the precocity and intensity of the infestations which it produces.

W. Y.

LWOFF (Marguerite). Millieu d'isolement et d'entretien pour *Schizotrypanum cruzi* Chagas. [**Cultivation Medium for** *T. cruzi*.]—*Bull. Soc. Path. Exot.* 1929. Dec. 11. Vol. 22. No. 10. pp. 909–912. [6 refs.]

After referring briefly to the various methods which have been devised for the cultivation of *T. cruzi*, the author describes one which he has used with great success in the cultivation of various Leptomonas forms. The medium is a simple fluid one consisting of a solution of proteins, but

slightly broken down and rich in polypeptones—Chapoteaut's peptone or "peptone pepsique" made from ox muscle according to Vaillant. The medium is inoculated with a few drops of infected blood and the culture kept at 18° C. to 22° C. The flagellates are present in numbers in from 10 to 15 days, and the culture flourishes up to the 45th day and then declines but continues even to the 60th day or further. Subcultures were made successfully about every 25th day.

W. Y.

DIOS (R.), WERNGREN (E. T.) & PEREZ (P.). Sensibilité du crapaud à l'infection expérimentale par *Trypanosoma cruzi*. [**Susceptibility of the Toad to Experimental Infection with** *T. cruzi*.]—*C.R. Soc. Biol.* 1929. Vol. 102. No. 36. pp. 1100–1101. [1 ref.]

Attempts to infect batrachians and reptiles with the pathogenic trypanosomes of mammals have proved unsuccessful, but NINO (1925) claims to have infected toads with *T. cruzi*. The authors have re-examined the question of the infectibility of toads by *T. cruzi*, and for the purpose have employed 64 toads common in the neighbourhood of Buenos Aires. The sources of the virus used were: (1) flagellates from the intestine of various naturally infected Triatoma; (2) the blood of infected children; and (3) the blood of mice infected from Triatoma. Examinations were made of the blood and organs of the inoculated toads, and subinoculations were made into white mice. The results were absolutely negative. The authors consider that an explanation of NINO's results is that the animals were previously infected with trypanosomes specific to them or by haemogregarines.

W. Y.

SICÉ (A.). Recherches sur le pouvoir floculant du sérum des trypanosomés. [**The Flocculating Property of the Serum in Human Trypanosomiasis.**]—*Bull. Soc. Path. Exot.* 1929. Dec. 11. Vol. 22. No. 10. pp. 912–916. [4 refs.]; and 1930. May 14. Vol. 23. No. 5. pp. 459–460. [1 ref.] [Pasteur Inst., Brazzaville.]

The object of the work described in these papers was to ascertain whether the serum of sleeping sickness patients precipitated alcoholic extracts of the organs of infected guineapigs or other animals. As the result of preliminary observations the author concentrated on alcoholic extracts of the heart muscle of sheep and goats infected with *T. congolense-dimorphon* or nagana. The extract is made as follows:—

100 gm. of minced heart muscle is allowed to macerate in 125 cc. of 95 per cent. alcohol for 7 days at 20° C. Filter and drain the residue; this is then spread on a glass plate and allowed to dry for 24 hours at 37° C., after which it is placed in 200 cc. of acetone and allowed to stand for 8 days at a temperature of over 20° C. Filter, drain and rinse the fragments and place them in a little more acetone for 24 hours in order to ensure the removal of all acetone soluble material. Filter, drain and dry the residue at 37° C. for 4 hours. The dried residue is then weighed and allowed to macerate in a closed flask with absolute alcohol—100 cc. of alcohol for each 15 gm. of dried residue. The maceration is continued for 12 days at over 20°C., the flask being shaken each day. Filter: the fluid which passes through represents the alcoholic extract of the acetone residue. It should be preserved in a sealed bottle.

As diluting fluid the author has tried various concentrations of sodium chloride in distilled water and finally has decided on 3·5 per cent., which gives undoubtedly the best results. The serum of the patient must be perfectly clear—containing neither haemoglobin nor bile pigments—and must be freshly obtained, and not heated.

The test is conducted as follows : Into one tube is dropped from a pipette 1 cc. of the alcoholic extract of acetone residue of the heart, and into another 15 cc. of the 3·5 per cent. NaCl solution. The two tubes are left in the water bath at 40° C. for 10 minutes, and then the contents of the second tube is poured into the first and that of the first into the second and so on until the two solutions are completely mixed and a perfectly homogeneous, very slightly opalescent fluid is obtained. This is left in the water bath at 40° C. for 10 minutes and then 1 cc. of it is added to each of the tubes containing 0·1 cc. of the various sera to be examined. The mixture is shaken and then allowed to stand.

With the object of hastening the reaction, the author investigated the various essences at his disposal and found that essence of cloves diluted with 50 times its volume of absolute alcohol when added to the heart extract greatly increased the rapidity of the reaction. With this modification 1 cc. of alcoholic extract of muscle is added to 1 cc. of the 1/50 solution of essence of cloves in the first tube and the 15 cc. of the 3·5 per cent. sodium chloride solution in the second. The mixture is then made as before.

The author states that he has studied the reaction with more than 1,300 sera. The sera of uninfected persons gives no reaction, the contents of the tubes remaining perfectly clear. But the sera of infected persons produces within a few moments a definite turbidity ; later flakes appear, varying in size and number and gradually fall to the bottom of the tubes. The reaction is complete within 12 hours.

Two exceptions were noticed. The first was seen in certain very early cases ; the second was more troublesome and seen in certain very advanced cases. In these latter cases the mixture did not remain perfectly clear, but there was no definite development of flakes. It is remarked that under the influence of prolonged treatment the reaction tends to disappear from the serum of many patients. Apart from these exceptions the flocculating power was always noted in the serum of trypanosomiasis cases, both European and native. It was not found in the sera of cases of syphilis, yaws, leprosy, tuberculosis, malaria and in 80 per cent. of relapsing fever cases.

In his second paper the author records that the serum of syphilitics sometimes gives a faint reaction, but rarely a reaction comparable to the complete flocculation obtained with the sera of cases of trypanosomiasis.

W. Y.

Le Gac (P.). La réaction de Targowla dans la trypanosomiase humaine. [**Targowla's Reaction in Human Trypanosomiasis.**]—*Bull. Soc. Path. Exot.* 1930. May 14. Vol. 23. No. 5. pp. 530–532.

The author has tested the Targowla reaction in cases of human trypanosomiasis.

The reagents required are : (1) recently distilled water ; and (2) pure elixir of paregoric prepared according to the Codex. The apparatus necessary consists of two haemolysis tubes and two dropping pipettes of the same calibre, i.e., delivering 53 drops of paregoric per cc. The glass-ware must be thoroughly cleaned with 2 per cent. HCl and then carefully rinsed with distilled water and dried.

The test is performed as follows : Into one haemolysis tube add successively 5 drops of distilled water, 15 drops of cerebrospinal fluid, and 5 drops of elixir of paregoric ; shake well to obtain a homogeneous mixture.

Into the second haemolysis tube(control tube) are placed 5 drops of distilled water and 5 drops of elixir of paregoric. The tubes are left at laboratory temperature and the result read after 12 to 24 hours.

+++	indicates	total precipitation.		
++	,,	partial	,,	
+	,,	slight	,,	
—	,,	no	,,	(negative reaction).

The test was examined in 9 cases of sleeping sickness—4 at the commencement of the second stage, 3 definitely in the second stage, and 2 in the third stage.

Of the 4 cases in the first category, 2 gave a +++ reaction, 1 a + reaction, and 1 a negative reaction. All the cases in the second and third categories gave a +++ reaction.

W. Y.

REGENDANZ (P.) & JURUKOFF (B.). Ueber das Adhäsionsphänomen der Trypanosomen. (Agglomeration, Blutplättchenbeladung, Leukozyten-Attachement.) [**The Adhesion Phenomenon of Trypanosomes. (Agglomeration, Platelet-Loading, Leucocyte Attachment.)**]—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1930. Vol. 66. No. 1/2. pp. 32–44. [15 refs.] [Inst. for Ship & Trop. Diseases, Hamburg.]

The following summary is given :—

The process known as agglomeration of trypanosomes is comparable with the platelet-loading and leucocyte-attachment phenomenon.

These three clumping phenomena are identical in nature and in cause. They are due to a secretion of tektin by the trypanosomes as a result of the action of immune sera on them .

The platelet-loading phenomenon can also be produced by the action of non-specific sera.

No definite facts can be obtained indicating the presence of different antibodies in the immune serum which can produce one or other of the phenomena.

The appearance of agglomeration or of platelet-loading is much more dependent on the number of the trypanosomes and that of leucocyte-attachment on the number of leucocytes.

The results of investigations on the appearance of agglomeration and platelet-loading are given. The phenomena were always produced by the corresponding immune sera with the original strain in the mouse and with the relapse strain which results from the formation of immune serum in the blood.

The platelet-loading phenomenon is, like the agglomeration phenomenon, of only limited value for the specific differentiation of trypanosomes ; its appearance is in general in favour of specific identity ; its failure, however, merely indicates the non-existence of strain identity and does not exclude specific identity.

It is proposed to gather together the three clumping phenomena—agglomeration, platelet-loading, and leucocyte attachment—under the name "adhesion phenomenon."

W. Y.

LLOYD (Ll.) & PAISLEY (J. C.). **Note on an Attempt to estimate the Number of Trypanosomes injected by an Infective Tsetse.**—*West African Med. Jl.* Lagos. 1929. Oct. Vol. 3. No. 2. pp. 31–32. [2 refs.]

This paper records an attempt to estimate by direct counts in the tsetse fly the number of trypanosomes which may be injected in the

act of feeding. With *T. brucei* the attempt was unsuccessful. Infective flies were induced to feed through a membrane from a small quantity of serum, and the fluid remaining was examined for the injected forms of the trypanosome. Although these were found, they were present in such small numbers that an estimate could not be made. With *T. congolense* and *T. vivax* it is possible to count the trypanosomes in the hypopharynx, which is the site of the infective forms. This was done in a series of freshly caught flies and also in a series which had been fed a few minutes previously. It was thought that the difference in the averages might give an approximate idea of the number injected. With *T. vivax* in *G. morsitans* the average number of hypopharynx forms was 158 (max. 1,000, min. 1) in 50 infected flies; directly after feeding it was 93 (max. 609, min. 0) in 46 infected flies. From these figures it is calculated that the number of trypanosomes injected was probably in the neighbourhood of 60. With *T. vivax* in freshly caught *G. tachinoides* the average was 145 (max. 467, min. 4).

With *T. congolense* in 9 infected *G. morsitans* the average number of trypanosomes in the hypopharynx was 268 (max. 604, min. 15); in 9 *G. morsitans* directly after feeding, the average was 256 (max. 1,000, min. 0). This gives for the small number counted an average of 12 infected forms injected. The authors write that one would have expected that the flow of salivary secretion down the hypopharynx during feeding would have dislodged all the trypanosomes therein. Often this flow must be greatly impeded by the trypanosomes, and may be almost prevented, as in the case of a *T. congolense* infection which was so massive that directly after feeding there were three plugs of trypanosomes in the hypopharynx; yet the fly gorged itself. Lester and Lloyd (1928) have previously shown that injection of salivary secretion into the hosts is not a necessary preliminary to feeding and that a fly deprived of its salivary gland may live and feed for as long as two months. Blocking of the hypopharynx by trypanosomes is consequently not an immediate disaster to the fly, and it would appear that relatively seldom is a massive infection dislodged from the hypopharynx when the fly is feeding.

Reference is made to the "preinfective" forms described by Lloyd and Johnson (1924) in the case of *T. vivax* and *T. congolense*. This form passes from the labial cavity to the hypopharynx and there, by transition, becomes the infective form. If a heavily infected hypopharynx is isolated in a minute drop of saline and carefully broken up this form may be found in considerable numbers, and the authors have one such preparation in which the preinfective forms are actually more numerous than the infective. The fact that all the hypopharyngeal forms are not dislodged by the flow of saliva when the fly feeds suggests that these preinfective forms are attached to the wall of the hypopharynx and when very numerous can actually prevent the saliva flowing until they are mature and, presumably, free.

The authors believe that this work throws light on the fact that a considerable number of flies in which the rate of infection by *T. vivax* and *T. congolense* is found to be high by microscopic examination of a sample may be fed on a susceptible animal, which subsequently may develop only one species of trypanosome or neither. It is inferred from this work that a tsetse seldom injects a dose of more than 1,000 infective forms of *T. vivax* or *T. congolense*.

W. Y.

LLOYD (Ll.). **Some Factors influencing the Trypanosome Infection Rate in Tsetse Flies.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1930. Mar. 17. Vol. 23. No. 5. pp. 533–542. With 1 text fig. [8 refs.]

This paper records a study of the transmissibility of two strains of *T. brucei* which had been maintained for a considerable period in laboratory animals. *T. brucei* Strain C was isolated from wild *G. morsitans* on March 13th, 1928, and at the beginning of the experiments was 377 days old and had passed through 1 dog, 28 rats, and 4 guineapigs. Its virulence for rats in the early stages is unknown, but in April and May, 1929, the average duration of the infection in 18 white rats was only 6 days.

T. brucei Strain D was isolated from *G. morsitans* on October 8th, 1928, and at the commencement of the experiments was 135 days old, and it passed through 1 rat, 2 monkeys, and 14 dogs. In April and May, 1929, the average duration of the infection in 11 rats was 17 days; it was thus less virulent than Strain C. The transmission experiments were conducted with laboratory-bred *tachinoides*. The results of the experiments are set forth in tables and the following summary is given :—

" Transmissions by *G. tachinoides* of two old laboratory strains of *T. brucei* separately, and of the two strains mixed in the fly have been carried out. When the strains were mixed, the rate of infection in the flies in the combined experiments was much greater than was obtained with either strain alone. The variation in the rate of infection in the individual groups makes it uncertain whether this higher rate was due to the mixing of the two strains. These experiments, however, are well worth repeating, since, if two old strains can rejuvenate one another, this will have an important bearing on the epidemiology of the diseases.

" The virulence to white rats of the strain produced by the mixing was greater than is usual with a newly isolated strain of *T. brucei*, equal to that of a strain 400 days old, and distinctly less than that of a strain 200 days old.

" The factors which influence the rate of infection in tsetse by trypanosomes are so many that it is impossible to estimate with any degree of accuracy the transmissibility of any particular strain.

" An unusual form of division in the gut flagellates was noted."

W. Y.

DUKE (H. Lyndhurst). **Factors influencing Trypanosome Infection Rate in Tsetse Flies.** [Correspondence.]—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1930. June 30. Vol. 24. No. 1. pp. 125–127.

In this letter Duke replies to certain statements made by LLOYD [see above]. Duke states that when he wrote the Commission's Report he held the view " that every time the appropriate form of the trypanosome was taken up by a tsetse, infection of the fly resulted." He did not intend to imply that Miss ROBERTSON took this extreme view; indeed she makes it clear that, in her opinion, different strains differ in their infectivity to tsetse. As a matter of fact, the work of the last two years has led Duke himself to modify this view. He objects to LLOYD's statement, " Considering the vast numbers of trypanosomes that the fly takes up in an infecting meal, which must include many individuals of any form which may be

demonstrable by the microscope, then the infection rates in a group of flies should be either nothing or 100 per cent." Duke states that he has never maintained that the forms that differ in the flies are demonstrable by the microscope; in fact, experience has shown that they are not. The few strains at Entebbe, which have been sufficiently tested to warrant the description "non-transmissible," remain polymorphic and show forms indistinguishable morphologically from those of their transmissible fellows.

Duke states that in the course of time he has produced evidence that a strain transmissible when first isolated, and for some time afterwards, may, in the course of prolonged upkeep by syringed passage, reach a stage where it can still infect the gut of a fly, but can no longer develop in the glands; later on, this gut-infecting power may also disappear. Figures are quoted from previously published work to support this contention. Duke considers LLOYD's conclusion "that it is impossible to estimate with any degree of accuracy the transmissibility of any particular strain" to be a little premature.

W. Y.

DUKE (H. Lyndhurst). **On the Susceptibility of the Two Sexes of** *G. palpalis* **to Infection with** *T. gambiense* **and** *T. rhodesiense.*—*Ann. Trop. Med. & Parasit.* 1930. Apr. 7. Vol. 24. No. 1. pp. 95–96. [2 refs.]

Experimental records of the transmission experiments carried out at the Entebbe laboratory during the three years August, 1926, to July, 1929, have been examined to see whether they afford any indication of a difference in susceptibility of infection between male and female *G. palpalis.* For the purpose of this review all experiments which contained at least one infected fly were selected; negative experiments were ignored. The total number of laboratory-bred *G. palpalis* considered was 24,509, of which 12,737 were males and 11,772 were females. Of this total 1,237 (5 per cent.) contained developmental forms of either *T. gambiense* or *T. rhodesiense.* Of the infected flies 581 were males and 656 females, i.e., 4·5 and 5·5 per cent. respectively. Further examination showed that of the 12,737 males exposed to infection 178 (1·3 per cent.) had flagellates in the salivary glands; and of the 11,772 females 183 (1·5 per cent.) were similarly infected; i.e., of the positive males 30·6 per cent. showed gland infections and of the positive females 27·8 per cent. The author considers that the above percentages have no general value as an indication of the susceptibility of *G. palpalis* to infection with *T. gambiense* and *T. rhodesiense,* but that they are merely useful for the purpose for which he has employed them, i.e., the comparison of the behaviour of the two sexes under identical conditions.

W. Y.

MACLEAN (George). **Stumpy and Posterior-Nuclear Forms in a Strain (Ferox) of** *Trypanosoma brucei.*—*Ann. Trop. Med. & Parasit.* 1929. Dec. 31. Vol. 23. No. 4. pp. 519–520. [6 refs.] [Path. Dept., Univ., & Western Infirmary, Glasgow.]

In this note the author records that he observed on several occasions stumpy forms in a "ferox" strain of *T. brucei* received from MESNIL in a

guineapig 16 months previously, and since kept in mice in the Pathological Department of Glasgow University. Among these stumpy forms were six individuals showing various degrees of posterior-nuclear development; one being a typical poste-riornuclear form.

W. Y.

AMAKO (T. H.). Beiträge zur Kenntnis der Schutzkraft der Milz und des Retikuloendothelial-Systems gegen eine Infektion des Organismus durch *Spirochaeta duttoni* und *Trypanosoma gambiense.* [**The Protective Power of the Spleen and Reticulo-Endothelium against Infection of the Organism by** *Sp. duttoni* **and** *T. gambiense.*]—*Zent. f. Bakt.* I. Abt. Orig. 1930. Apr. 26. Vol. 116. No. 4/5. pp. 280–284. [27 refs.] [Med. Faculty, Kyushu Imperial Univ., Fukuoka, Japan.]

A large series of mice was injected with a definite dose of *Sp. duttoni* at various intervals varying from the day after splenectomy until 14 days later. As controls normal animals, and those in which laparotomy alone had been performed, were used. The mortality rate of these different groups of animals is shown in a table. In the normal mice it was 5·8 per cent., in the laparotomy group 6·3 per cent., and in the splenectomized mice it varied from 85·6 per cent. in those injected the day after splenectomy to 20·4 per cent. amongst those injected 7 days later and 15·2 per cent. for those injected 14 days later.

Comparable results were obtained in the case of guineapigs infected with *T. gambiense* or *T. equiperdum.* It is concluded that splenectomy greatly decreases the resistance of the animals to infection with spirochaetes and trypanosomes ; the protocols show that from the fourth day after splenectomy the resistance is gradually recovered.

Further experiments showed that partial splenectomy only slightly decreased the animal's resistance and that intraperitoneal implantation of spleen tissue in splenectomized animals partially compensated the effects of the latter process.

Blocking of the reticulo-endothelium by india ink or electrocollargol had a similar, but less pronounced, action to splenectomy, and simultaneous splenectomy and blocking exerted a very pronounced action.

W. Y.

NIESCHULZ (Otto) & WAWO-ROENTOE (F. K.). Ueber den Einfluss der Milzexstirpation bei Infektionen mit *Trypanosoma gambiense* und *Schizotrypanum cruzi.* [**On the Influence of Spleen Extirpation on** *T. gambiense* **and** *T. cruzi* **Infections.**]—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1930. Vol. 65. No. 3/4. pp. 312–317. [6 refs.] [Inst. for Infectious Diseases & Parasit., Reich Univ., Utrecht.]

After referring to the fact that KRITSCHEWSKI and SCHWARZMANN had found that splenectomy exercised no influence on the duration of *T. gambiense* infections in mice, whilst KIKUTH and REGENDANZ had found that in splenectomized rats the infection ran a quicker course than in normal animals, the authors record that in their own experiments on surra infections in dogs splenectomy exercised a very definite effect.

In the present work five dogs, three of which had been previously splenectomized, were infected with *T. gambiense.* The intervals between splenectomy and infection were respectively 13, 11 and 1 days. Daily examinations of the blood were made and the results recorded in a table from which it is seen that the infections in the splenectomized dogs were much more severe than in the control animals.

In a similar experiment conducted with *T. cruzi* there was apparently no difference between the course of the infection in the splenectomized and normal animals.

The following are the conclusions :—

1. In dogs the spleen exerts a definite influence on the course of *T. gambiense* infection. The remainder of the reticulo-endothelium plays no rôle in the defence mechanism.

2. In *T. cruzi* infections of dogs splenectomy is without effect.

W. Y.

AMAKO (T. H.). Ueber die Rolle der Milz und der Leber bei der Antikörperbildung bei experimenteller Trypanosomiasis. [**The Rôle of the Spleen and Liver in Antibody Formation in Experimental Trypanosomiasis.**]—*Zent. f. Bakt.* I. Abt. Orig. 1930. July 28. Vol. 117. No. 7/8. pp. 470–479. With 2 charts in text. [139 refs.]

The author has conducted investigations on the antibodies which appear in trypanosome immunity, especially on the place of formation of the agglomeratinins. With this object in view, he has devoted particular attention to the rôle of the liver and spleen.

Mice were infected with such a dose of *T. gambiense* that they habitually died in 3 days. At the height of the infection they were bled into citrated saline and the parasites were then washed thrice in saline and finally suspended in a 0·3 per cent. solution of lecithin in normal saline. For the agglomeration investigation living trypanosomes were suspended in deactivated rabbit serum. The trypanosome vaccine was made in a formol-saline solution, consisting of physiological saline 9·5 cc. and formalin 20 per cent. solution 0·5 cc. ; the suspension was immediately centrifuged and re-suspended to a standard concentration in physiological saline.

In the determination of the agglomeratinins the author has combined the microscopic and macroscopic methods. Rabbits were immunized by injection of the lecithin solution vaccine.

The following summary is given :—

1. The spleen and liver are the chief site of the formation of agglomeratinins ; in the initial stages of immunization the formation of agglomeratinins in the spleen and liver is especially active. In the course of time, after vaccination, however, change in the agglomeratinin picture is no longer produced either by splenectomy or functional disturbance of the liver.

2. Transplantation of the spleen or liver of rabbits which were previously immunized can produce agglomeratinins. The spleen is more active than the liver.

3. On direct injection of small amounts of vaccine into the spleen or liver the agglomeratinin appeared in the peripheral blood more quickly and in greater degree than after intravenous immunization with similar doses of vaccine.

4. Examination of organ extracts of immunized rabbits showed that the greatest amount of agglomeratinins were formed in the liver and spleen.

5. The spleen appeared to be of greater significance as a site of formation of agglomeratinin than did the liver. The spleen and liver stand in relationship one to another : splenectomy is compensated by the liver, and destruction of the function of the liver by the spleen.

W. Y.

i. HOEPPLI (R.) & REGENDANZ (P.). Beiträge zur Pathogenese und Histopathologie der Trypanosomeninfektionen der Tiere. [**Pathogenesis and Histopathology of Trypanosome Infections of Animals.**] I. Ueber die Pathogenese der Gewebsveränderungen bei der Trypanosomeninfektion, die Einwanderung der Trypanosomen in das Gewebe, in die serösen Flüssigkeiten der Körperhöhlen und in das Konjunktivalsekret. [**Pathogeny of Tissue Changes in Trypanosome Infections; Penetration of Trypanosomes into the Tissues, Serous Fluids, and Conjunctival Secretion.**] [REGENDANZ.] II. Histologischer Teil. Gewebsveränderungen bei Trypanosomeninfektionen der Tiere. [**Tissue Changes in Trypanosome Infections.**] [HOEPPLI.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1930. Jan. & Feb. Vol. 34. Nos. 1 & 2. pp. 1–18; 67–99. With 11 text figs. [30 refs.] [Inst. for Ship & Trop. Diseases, Hamburg.]

ii. REGENDANZ (P.). Ueber die Ansammlung von Trypanosomen in den Flüssigkeiten der Körperhöhlen und ihre Bedeutung für das Entstehen von Gewebsveränderungen. (Nach experimentellen Untersuchungen.) [**Accumulation of Trypanosomes in the Fluids of the Body Cavities and its Significance for the Genesis of Tissue Changes.**]—*Beihefte z. Arch. f. Schiffs- u. Trop.-Hyg.* 1929. Vol. 33. No. 3. pp. 97–101 (181–185).

i. The first part of this paper, for which Regendanz is responsible, deals with the pathogenesis of the tissue changes in trypanosome infections, and the migration of the trypanosomes into the tissues, the serum fluids of the body cavities and the conjunctival secretion. In his experiments the author employed rats, hamsters, rabbits, cats, dogs and monkeys infected with *T. gambiense*, *T. rhodesiense*, *T. brucei* or *T. equiperdum*.

The following summary is given of this portion of the work :—

In trypanosome infections of various species of animals the occurrence of trypanosomes in the fluids of the body cavities (except the cerebrospinal fluid) was investigated and its connexion with the histopathological changes in the corresponding organs examined.

In the pericardial fluid trypanosomes were always found if pronounced pathological changes existed in the epi- and myo-cardium, and sometimes also in the absence of these.

In one animal numerous trypanosomes were found in the hydrocele fluid and in the cavities of the testes.

The trypanosomes may migrate from the serous fluids into the tissues of the organs and these give rise to histopathological changes.

In the aqueous humour trypanosomes—often in great number—were always found when pathological lesions of the eye (opacity of the lens, iridocyclitis, keratitis, conjunctivitis) were manifest.

The trypanosomes migrated out of the aqueous humour and tissue of the iris into the conjunctival tissue and secretion of the conjunctival sac.

Trypanosomes were also found in great numbers in the choroidal plexus outside the blood vessels. In the same way that they escape from the conjunctiva into the secretion of the conjunctival sac, so they can pass from the tissue of the choroidal plexus into the cerebrospinal fluid.

The escape of the trypanosomes from the small blood vessels is due to a toxic action of the parasites. Owing to the long continued action of a mildly irritating toxin there arises a feeble leucodiapedetic condition of the minute blood vessels which renders possible the migration of the trypanosomes into the tissues.

Clinical findings in cases of human trypanosomiasis render it possible that similar pathological processes will also be found to occur in sleeping sickness.

The second part, which is by Hoeppli, deals with the histology of the tissue changes in trypanosomal infections of animals.

The following summary is given :—

The histopathological changes, which appeared in the course of trypanosomal infection in 37 animals (monkeys, dogs, cats, rabbits, guineapigs and hamsters), are described.

These are essentially entirely dependent on the duration of the infection and not on the species of trypanosome. The species of the animal host played a part in so far as inflammatory changes of the myocardium, which are relatively pronounced in monkeys, were never found in dogs or cats.

The most noteworthy histological changes which occur in trypanosomal infections are myocarditis and pericarditis with deposition of numerous trypanosomes in the inflammatory foci ; and furthermore, degeneration of the lens, iridocyclitis, and conjunctivitis, with the migration of trypanosomes into the subconjunctival tissue and into the tissue of the corpus ciliare and of the iris.

In the spleen and lymph nodes there occurs in the course of the infection a gradual replacement of the lymphocytes by plasma cells and finally by numerous macrophages.

In the brain one finds, in infections which are quickly fatal, as a rule only a degeneration of the ganglion cells.

The liver and lungs show numerous macrophages ; in the liver a moderate degree of parenchymatous degeneration was found only four times, and the same number of times small necroses in the lungs were seen.

In the kidneys the epithelium of the renal tubules was frequently damaged, but the glomeruli were in the majority of cases unchanged.

The predominate cells in the inflammatory changes of the various organs were small round cells and macrophages,with scanty plasma cells and polymorphonuclear leucocytes. Cellular infiltration was found in the cardiac muscle, in the eyes, in the periportal tissue of the liver, in the meninges, in the choroidal plexus of the lateral ventricles, in interstitial tissue of the testes and the kidneys, in the striped muscle, and in the corium.

In sections trypanosomes were seen within the blood vessels of practically all the organs and more than once outside the blood vessels in the tissues.

ii. A general account of these observations and experiments with appropriate comment.

W. Y.

HARTMANN (E.). Rezidivstammbildung und Schankerimmunität bei der Trypanosomiasis des Kaninchens. [**Relapse Strain Formation and Chancre Immunity in Trypanosomiasis of Rabbits.**]—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1930. Vol. 65. No. 1/2. pp. 53–60. With 1 text fig. [Skin Clinic, Univ., Münster.]

After referring in some detail to the work of STÜHMER (1916), the author passes to an experimental enquiry whether chancre immunity occurs in superinfection with trypanosome strains which are relapse variants of the original strain. He used in his work nagana (Prowazek). As STÜHMER has shown, if rabbits are inoculated intravenously or subcutaneously with trypanosomes the parasites appear in the blood in 3 or 4 days—on subcutaneous inoculation coincidently with the development of a primary lesion. These parasites, which agree with the primary strain, disappear from the blood in a few days. After a latent period trypanosomes again appear in the blood ; these, which are resistant to the by now highly developed immune bodies, are the relapse strains. If this relapse strain R_1 be injected into a second rabbit, a second relapse strain R_2 can be obtained, and if this be injected into a third rabbit a third relapse strain R_3 and so on. Having obtained in this manner a third relapse strain R_3, the author performed two groups of experiments : In Group I rabbits were infected in the

right scrotum with the original strain A and superinfected elsewhere (eye or left scrotum) with relapse strain R_3 and the original strain A; and in Group 2 rabbits were infected in the right scrotum with the relapse strain R_3 and superinfected with the original strain A and the relapse strain R_3. Nine such experiments showed clearly that the relapse strain and original strains behaved as heterologous strains, infection with one preventing chancre formation on superinfection with the same strain, but not with the other.

W. Y.

FISCHL (Viktor) & KUSSAT (Emmy). Atypische Naganainfektion bei Ratten. [**Atypical Nagana Infection in Rats.**]—*Klin. Woch.* 1930. June 21. Vol. 9. No. 25. pp. 1175–1176. [9 refs.]

The experiments described were conducted with two strains of nagana (Prowazek) which in the ordinary way killed rats in a few days. It was found, however, that on subcutaneous, intracutaneous or intravenous injection of healthy rats with small quantities (·05 to 1 cc.) of a suspension of trypanosomes, which had been centrifuged for three minutes, in the trypanosome-containing mouse serum or blood, or in physiological saline or rabbit serum (the suspension containing 1 parasite to a microscope field) atypical infections were produced in 10 to 30 per cent. of cases. As is shown in a table these infections were of three kinds :—

(*a*) The trypanosomes are found in varying numbers in the peripheral blood or persist until the death of the animal.

(*b*) The trypanosomes appear in the tail-blood just as do the spirochaetes of relapsing fever, sometimes being found and at other times being absent. Later subinoculation of the blood or organ extracts may reveal either a latent infection or spontaneous cure.

(*c*) The trypanosomes appear only once, for one or more days, in the peripheral blood, and then disappear and their presence cannot subsequently be demonstrated by blood examination or subinoculation of blood or organ extracts into healthy animals. If such rats which have thus recovered be further inoculated in the ordinary way with the same strain they exhibit a considerable degree of immunity which may even be absolute.

No satisfactory explanation of these facts can yet be offered.

W. Y.

SCHWETZ (J.) & FORNARA (L.). Y a-t-il des formes d'évolution des trypanosomes chez l'hôte vertébré ? [**Developmental Forms of Trypanosomes in the Vertebrate Host ?**]—*Bull. Soc. Path. Exot.* 1929. Nov. 13. Vol. 22. No. 9. pp. 862–871. With 2 figs. [4 refs.] [Parasit. Lab., Stanleyville.]

Whilst making a series of smears from the cardiac muscle of a calf infected with *T. congolense* with the object of obtaining sarcocystis, the authors encountered a mass of organisms resembling leishmania, and with a view to discovering whether these were special forms of the trypanosomes invading the tissues, it was decided to cut sections and examine smears of the organs of animals dying from trypanosomiasis. Details are given of the examination of 8 calves. The blood and organs of the first 7 were completely negative, but the 8th showed the presence of parasites in considerable number in the organs. As a rule, only typical *T. congolense* were found, but smears of the brain and myocardium revealed also leishmania forms.

In addition to cattle, the authors examined a number of sheep and pigs. In one young pig, which was in very poor condition, examination of the peripheral blood showed the presence of numerous trypanosomes; these bore some resemblance to *congolense* but were longer and thinner having, in the authors' opinion, more the appearance of *T. dimorphon* [possibly they were *T. simiae*]. The animal was killed and smears and sections of the

organs examined. In most of these trypanosomal and leishmania forms were found, sometimes in considerable numbers. [This paper should be compared with that of PERUZZI, this *Bulletin*, Vol. 25, p. 771].

W. Y.

ARNAUD (R.). Nouveau procédé de dosage des albumines rachidiennes. [**New Method of Estimation of Albumin in C.S.F.**]—*Bull. Soc. Path. Exot.* 1930. Apr. 9. Vol. 23. No. 4. pp. 383–384.

In view of the fact that the new method for estimating the amount of albumin in the spinal fluid recently described by the author [*ante*, p. 237] has not given complete satisfaction, Arnaud has modified this technique somewhat. His present method is as follows :—

The cerebro-spinal fluid (4·3 cc.) is put in a Siccard's tube, heated to boiling, and then ·5 cc. of the following reagent is added :—

Trichloracetic acid ...	...	10 gm.
Alcohol, 95 per cent.,	...	30 cc.
Carbon tetrachloride	...	2·5 cc.

The mixture is then well shaken and allowed to stand.

The author claims that with this solution it is possible to read the results in from 20 to 30 mins., whereas with the classical procedure 5 hours are required. As the result of his comparison with the classical technique, the author concludes that his method gives readings of about one-tenth less than does the latter technique.

W. Y.

SCHERN (Kurt). Ueber die Störung des Zuckerstoffwechsels bei Trypanosomiasen und Spirochätosen. [**The Disturbance of the Sugar Metabolism in Trypanosomal and Spirochaetal Infections.**]—*Biochem. Ztschr.* 1928. Vol. 193. pp. 264–268. [12 refs.] [Vet. High School, Montevideo.]

The author publishes in a table the results of daily estimations of the blood sugar in a normal rabbit, and in three rabbits and a horse infected with *T. equinum*. He believes that infection with trypanosomes may produce not only a hypoglycaemia, but at times a hyperglycaemia and that his investigations have shown that these infections must be regarded as problems in metabolism. This idea gives one a new insight into the pathology of the infection and creates new foundations for therapy.

W. Y.

LINTON (Richard W.). **The Blood Chemistry of an Acute Trypanosome Infection.**—*Jl. Experim. Med.* 1930. July 1. Vol. 52. No. 1. pp. 103–111. [14 refs.] [College of Physicians & Surgeons, Columbia Univ., New York.]

Recognition of the fact that the blood chemistry is altered has given a new direction to the study of experimental trypanosome infections. A brief summary is given of the work on this subject which has already been published. The author worked with a strain of *T. equiperdum* which killed rats in from 72 to 96 hours.

The following is the summary :—

" The CO_2 capacity of the serum is markedly lowered early in infection with *Trypanosoma equiperdum*.

" The non-protein nitrogen and uric acid constituents of the blood are increased in the terminal stages. The kidneys also show terminal degenerative changes.

" The cholesterol remains unchanged throughout.

" Lecithin is markedly increased, most of the observations showing a 20 per cent. to 50 per cent. rise in this substance.

" Liver glycogen is lower than normal in the early stages and could not be demonstrated in the later stages of the infection.

" The blood sugar remains normal until a very late period in the disease."

W. Y.

CALIFANO (L.) & GRITTI (P.). Ricerche sui fermenti dei tripanosomi. La lipasi, l'amilasi, i processi deidrogenativi (deidrogenasi) del *Trypanosoma brucei*. [**The Existence of Ferments in Trypanosomes** (*T. brucei*).] —*Riv. di Patologia Sperim.* 1930. Vol. 5. No. 1. pp. 9–15.

The author investigated the question of the presence or absence of lipase, amylase and reducing ferments in *T. brucei*. For the first he used the method of Roma and Michaelis, and found that the surface tension of a mixture of the test-suspension with one of *T. brucei* did not alter materially after prolonged contact, the fat not being acted upon. For amylase he used Hagedorn Jensen's process and again obtained negative results, there being no action in splitting polysaccharides. For the third he used Lipschitz's method of transformation of dinitrobenzol into nitrophenyl hydroxylamine, and found that an active oxidizing ferment was present.

H. H. S.

HARVEY (D.). **Three Years in Central Angoniland with the Sleeping Sickness Commission.**—*Jl. Roy. Army Med. Corps.* 1930. May. Vol. 54. No. 5. pp. 332–355. With 12 text figs.

A popular account of the work of the Royal Societies Sleeping Sickness Commission in Nyasaland 1911–1914.

W. Y.

STEUDEL. Der jetzige Stand der Schlafkrankheitsbekämpfung in Kamerun. [**The Present Position of the Sleeping Sickness Campaign in Cameroons.**]—*Muench. Med. Woch.* 1930. Feb. 7. Vol. 77. No. 6. pp. 228–231. [2 refs.]

This article gives a critical account of JAMOT's work in the Cameroons [*ante*, p. 222.] The author laments the fact that German medical men no longer have the opportunity of working on this great problem.

W. Y.

STEUDEL (Emil). Der gegenwärtige Stand der Schlafkrankheitsbekämpfung in Afrika. [**The Present Position of the Sleeping Sickness Campaign in Africa.**]—*Beihefte z. Arch. f. Schiffs- u. Trop.-Hyg.* 1929. Vol. 33. No. 3. pp. 113–129 (197–213). With 2 text figs. (maps).

This article gives a general account of the history of sleeping sickness work in German East Africa and in the Cameroons; it contains nothing new and calls for no special notice.

W. Y.

CHAGAS (Evandro). Estudo electro-cardiographico na fórma cardiaca da trypanosomiase americana.—*Folha Med.* 1930. Apr. 25 & May 15. Vol. 11. Nos. 12 & 14. pp. 135–137. With 8 text figs; pp. 159–160. With 6 text figs. [Oswaldo Cruz Hosp., Rio de Janeiro.]

ZSCHUCKE (Johannes) & NAJERA (Luis). Observaciones sobre un caso mortal de tripanosomiasis humana tratado por el Bayer 205.—*Medicina Países Cálidos.* Madrid. 1930. Jan. Vol. 3. No. 1. pp. 39–44. French summary (5 lines).

CHOLERA.

LEGER (Marcel). Le choléra et son épidémiologie. [**Epidemiology of Cholera.**]—*Rev. Prat. Malad. des Pays Chauds.* 1929. Sept. Year 8. Vol. 11. No. 9. pp. 401–404, 407–415.

This is a long and interesting address on the history, causation and general epidemiology of cholera. The author points out that China and India are the permanent homes of the disease and gives some references to ancient writers from Chinese texts onward and dates of noted epidemics from 1761 to 1900 in India and China. He then describes the discovery of *V. cholerae* and the way of infection and transmission, including "Carriers." Mass infection generally comes from water, but food, fruit, etc., may be contaminated and give rise to outbreaks.

J. H. Tull Walsh.

MORISON (J.), CHOUDHURY (B. K. Pal) & RAHMAN (H.). **Cholera in a Khasi Village and its Treatment with Bacteriophage.**—*Indian Med. Gaz.* 1930. Mar. Vol. 65. No. 3. pp. 121–124. With 2 graphs in text.

This is a very interesting and well-written paper telling in detail of an outbreak of cholera in Jakrem, with its 744 inhabitants, which had never within the memory of the villagers been visited by cholera. On October 3rd, 1929, eleven men went south to seek work, but on arriving at Mardon they found cholera, and after staying one night, returned. One man who travelled with them died of cholera. There were other deaths at Ingimorolim. The Jakrem party were met by the village elders and forbidden to enter the village until the omens had been consulted. An egg-breaking ceremony was held to see if the cholera demon (Ka Khlam with six hands and no legs) was sitting on the shoulders of any of the Jakram party. The egg showed he was not there and the men entered the village bringing the cholera with them. The epidemic continued until the 28th. There were 143 cases with 70 deaths. The cases are divided into two groups, 10th to 17th, when no bacteriophage was available, and 18th to 28th, when bacteriophage was used and give the following figures: Group I: Cases 71, deaths, 51. Group II: Cases 72, deaths, 19. In the 65 cases receiving bacteriophage there were only 7 deaths. The bacteriophage was given with water every 2 to 4 hours until vomiting and purging ceased and urination began.

J. H. T. W.

SOUCHARD (L.). Essais thérapeutiques du choléra par le bactériophage de d'Hérelle. [**Treatment of Cholera with Bacteriophage.**]—*Ann. Inst. Pasteur.* 1930. Feb. Vol. 44. No. 2. pp. 125–140. [Pasteur Inst., Saigon.]

Having read the results obtained in India by M. D'HERELLE, the author, with the help of Dr. GAULTIER, secured the strain of bacteriophage used by D'HERELLE in 1927. For testing virulence the technique of D'HERELLE was closely followed, but in spite of

all precautions it was not possible to obtain the maximum virulence [this *Bulletin*, Vol. 26, p. 86 (D'HERELLE)]. Between December, 1928 and June, 1929, 27 cases were treated without any selection as to data of attack or severity of symptoms. The contents of one 2·0 cc. ampoule diluted with 10 to 15·0 cc. of cold water was given to each case in the author's presence and the contents of two other ampoules in a glass of water, were given in spoonfuls during the following three hours. The Table given shows that 24 died. Of the three that recovered the cholera vibrio does not appear to have been found in Nos. 7 and 15 ; it was found in Case 26. [See also this *Bulletin*, Vol. 25, p. 677 (ROSS).]

J. H. T. W.

MIYAKE (Masunori). **On Cholera Like Symptoms produced by an Organism belonging to the Colon Group.**—*Saikingaku Zasshi* (*Jl. Bacteriology*). 1929. Feb. No. 396. [Summarized in *Japan Med. World.* 1929. June 15. Vol. 9. No. 6. p. 197.]

The author failed to isolate *V. cholerae* from a patient with typical symptoms of cholera : vomiting, diarrhoea, dehydration and cramp. He did find in almost pure culture in the stools a bacillus which he calls " X." It resembles the typhoid bacillus, but is somewhat smaller and movement is more vigorous. It has several flagella and is gram negative. In cultural characters it resembles paratyphoid A and B ; but the immunological reactions are entirely different. It is strongly toxic to the mouse, but not so strongly to guineapigs and rabbits. Serum of those immunized with this organism has an agglutination titre of 40,000 dilution. Symptoms the same as cholera but with bloody stools during convalescence. A second patient became ill with the same symptoms while nursing the first case.

J. H. T. W.

JOLLY (G.), DA COSTA (J. J. G.) & SHOUNG (Ah.). **The Value of Preventive Inoculation against Cholera.**—*Indian Med. Gaz.* 1929. Nov. Vol. 64. No. 11. pp. 618–619.

For inoculation on a large scale it is essential that the procedure should be as simple as possible. It is evident that the method here adopted was the one of a single dose instead of two doses, separated by an interval. Large numbers were inoculated " during the course of the epidemic." The statistician, however, may cavil at the significance of the data obtained under such conditions. The difficulty of getting records which would serve for setting up frequency distributions of age, sex, social position, intelligence, infirmity, etc., of the contrasted populations, in fact, of the degree to which each was " at risk," is admittedly very great. It would be interesting to know if all the deaths occurring in the population concerned, before inoculation was begun, were debited to the non-inoculated.

W. F. Harvey.

KONRICH (F.). Ueber die Brauchbarkeitsdauer des Typhus- und Choleraimpfstoffs. [**Duration of Potency of Typhoid and Cholera Vaccines.**]—*Zent. f. Bakt.* I. Abt. Orig. 1929. Oct. 31. Vol. 114. No. 4/6. pp. 420–427. [7 refs.]

With preparation of vaccines on a large scale the question of cost of manufacture becomes increasingly important. Experience suggests

that the effects of time and temperature are the most likely to be deleterious to potency, and economy demands that exact limits should be set to these factors. The tests here applied are two, the agglutinogenic and the protective action of the vaccines. It was found that they did not afford corresponding results. Obviously the protective action is that which should be preferred as a gauge of potency. Typhoid and cholera vaccines can be preserved for a much longer time than it has hitherto been judged safe to employ. A stay of two years in the ice chest will not result in any serious loss of potency. Even an ordinary room temperature is not very rapidly harmful. Refrigeration expense may be cut down considerably by restricting storage space, for which reason vaccines should be preserved in concentrated form and diluted as required. In order to eliminate all effect of temperature on potency it may even be advisable to cut out the usual sterilization by heat. Simple preservation of the living organisms in normal salt solution will in time afford a sterile preparation without any application of heat. One great advantage of making use of vaccines which have been kept for some time after preparation, is that the reaction caused by them on inoculation gradually diminishes to vanishing point.

W. F. Harvey.

FUJITSUNA (Sh.). Ueber den Unterschied zwischen der gewöhnlichen Vakzine und dem Koktigen bezüglich Choleravibrionen in der Toxizität und im immunisatorischen Erfolge. [**Relative Toxicity and Immunogenic Power of Ordinary Cholera Vaccine and Koktigen.**]—*Zent. f. Bakt.* I. Abt. Orig. 1930. Mar. 28. Vol. 116. No. 2/3. pp. 180–185. [7 refs.] [Surg. Clinic, Imperial Univ., Kyoto.]

Koktigen is a contraction for "Koktoimmunogen," which is the name given to a boiled suspension of bacteria or bacterial filtrate (see TORIKATA & FUJIMOTO, this *Bulletin*, Vol. 24, p. 796). The koktigen cholera vaccine has a large minimum lethal dose; causes less leukopenia and a greater hyperleukocytosis; promotes better phagocytosis; gives rise to less local and systemic reaction and evokes greater antibody response than ordinary vaccine. The reason for this is that ordinary vaccine contains "impedin," which is destroyed by boiling and which paralyses immunizing action both *in vivo* and *in vitro*.

W. F. Harvey

UKIL (A. C.) & GUHA THAKURTA (S. R.). Sérum de convalescents de choléra. Variabilité de sa richesse en anticorps spécifique. Son emploi en thérapeutique. [**Variability of Convalescent Cholera Serum in Antibodies. Therapeutic Use.**]—*C.R. Soc. Biol.* 1930. Feb. 7. Vol. 103. No. 5. pp. 310–311. [1 ref.] [Chittaranjan Hosp., Calcutta.]

The bacteriolytic power of sera of patients convalescent from cholera was tested by the method of colony count at the stages: (1) when bile reappeared in the stools, (2) when the stools became solid, (3) one to three weeks after the stools became solid, when they no longer gave cultures of vibrios. The three stages are accompanied by progressive augmentation of the bacteriolytic power of the patients' sera and the last stage is maintained for several weeks. Sixty per cent. of cases admitted to hospital have been found able to furnish powerful bacteriolytic sera in the doses of 10 to 15 cc. for intravenous injection.

W. F. Harvey.

BRAHMACHARI (B. B.). **Transformation of *Vibrio cholerae* into a Non-Agglutinating Vibrio and Back into the Agglutinating Type.**—*Calcutta Med. Jl.* 1929. Nov. Vol. 24. No. 5. pp. 181–190. [7 refs.]

The strain used was a vibrio from an acute case of cholera which agglutinated with an anticholera serum to full titre of 1 in 8,000. A rabbit, after examination of its stools to exclude the possibility of vibrios being normally present, was inoculated intravenously on four successive occasions. The agglutination titre of the animal reached 1 in 16,000 with the last inoculation, after which it began to decline and ultimately reached zero. The vibrio isolated from the stool when agglutinin was at a maximum was highly agglutinable. With loss of agglutinin vibrios isolated became less and less agglutinable and finally inagglutinable, although a tendency to agglutinate at low titre reappeared before the animal finally died. Beginning with one of the non-agglutinating vibrios isolated, subpassages were made from guineapig to guineapig by intraperitoneal injection of vibrios isolated from the stools. The result was that the vibrio obtained from the stool of the 9th guineapig agglutinated with cholera serum again. Its reversion to a standard agglutinable vibrio was expedited by growing it in cholera antiserum. Thus the author claims to have accomplished the conversion of an agglutinable cholera vibrio into an inagglutinable form and then restored it to the original agglutinable form.

W. F. Harvey.

FINKELSTEIN (M. H.). **The Haemolytic Properties of Cholera, Para-Cholera and Allied Vibrios, with Special Reference to their Effect on Blood Media.**—*Brit. Jl. Experim. Path.* 1930. Feb. Vol. 11. No. 1. pp. 54–64. [4 refs.] [Bact. Dept., Univ., Edinburgh.]

Much of the confusion in description of vibrios as haemolytic and non-haemolytic has been due to the varying technique used and perhaps to the use of red cells of a resistant animal species. For the test ox or sheep blood should be used. In these experiments haemolysis was tested by adding varying quantities of vibrios grown in neutral peptone water to tubes containing 1 cc. of a 3 per cent. suspension of washed red cells in 0·85 per cent. salt solution. The tubes are kept for 4 hours at 37° C. and the readings then made.

One of the objects of these experiments was to distinguish between lysis of red blood cells and " clearing " of heated or " chocolate " blood agar. The latter effect is to be differentiated from the former ; it is attributed to the conversion of haemoglobin into colourless derivatives and formation of alkali haematin. Classification of vibrios by their haemolytic action and by their ability to clear heated blood cannot be correlated with their serological characteristics. Vibrio strains which have a clearing effect when grown on medium containing heated blood also clear blood agar. The true cholera vibrio is non-haemolytic in marked contrast to the El Tor and para-cholera vibrios. The El Tor vibrios, again, produce lysis in blood agar cultures, but have no clearing effect when grown on heated blood medium. Some strains of vibrio, on the other hand, can both lyse blood suspensions and exert clearing effect on heated blood medium. The blood lysis of El Tor and paracholera vibrios extends further into a blood agar medium than the brown-tinted clearing produced on that medium by vibrios which can act on heated blood. Lysis proper appears to be due to a filterable haemolysin and "clearing" of heated blood to "a chemically active agent possibly of ferment nature capable of splitting haemoglobin into alkali haematin and other products."

W. F. Harvey.

SORU (Eugénie). Tension superficielle des suspensions de vibrions cholériques normaux et sensibilisés. [**Surface Tension of Normal and Sensitized Cholera Vibrios.**]—*C.R. Soc. Biol.* 1930. Feb. 28. Vol. 103. No. 8. pp. 635–637. [2 refs.]

The fluid in which the organisms were suspended was isotonic saccharose. Those acted on by normal serum and by cholera serum were first washed free of serum before being suspended in saccharose for test. These tests showed that specific antiserum caused marked lowering of surface tension in the case of bacilli acted on by it. Normal serum or non-specific agglutinating serum caused only slight lowering.

W. F. Harvey.

SOELEIMAN (Mas M.) & VAN NIEKERK (J.). Choleratoxine. [**Cholera Toxin.**] —*Zent. f. Bakt.* I. Abt. Orig. 1930. June 3. Vol. 117. No. 1/3. pp. 19–30. [10 refs.] [Inst. for Trop. Med., Reich Univ., Leiden.]

The nature of the cholera toxin has been much disputed. Its development has been explained on such theories as that : (*a*) It is due to the decomposition of the medium in which the vibrios grow. (*b*) The living vibrios excrete a toxic metabolic product, denominated soluble toxin or exotoxin. (*c*) During the life and after the death of the vibrios a substance is formed which is not toxic, but becomes so on admixture with serum (anaphylaxis theory). (*d*) The toxin is closely bound to the body of the vibrio and is only set free at its death ; the so-called endotoxin theory. In this research a number of true cholera strains were used and, as a control, a toxic vibrio known as Calcutta 30. The medium on which the vibrios were grown had the composition : bouillon of pH 7·7, 45 cc. ; glucose, 0·45 gm. ; buffer solution of pH 8, 5 cc. ; chalk 1 gm. Toxin was obtained by centrifugation of the bouillon culture at 9,000 revolutions a minute, representing a pressure of 3,500 kgm., and subsequent concentration of the supernatant fluid by evaporation to dryness. Guineapigs inoculated intraperitoneally showed the usual symptom-complex of cholera intoxication. Further experiments showed that the toxin of Calcutta 30 differed markedly from that of the cholera vibrios in that it exercised a paralysing action by perfusion through the living rabbit heart, whereas the latter did not. The conclusion reached by the authors is that, by the action of the acids developed in the culture medium and by the pressure to which the vibrios are subjected in centrifuging, the bacterial membrane is rendered permeable and bacterial protoplasm is passed into the surrounding bouillon. It is, again, a verdict given in favour of cholera toxin being an endotoxin. The toxin of Calcutta 30 did not show itself capable of giving rise in immunized rabbits to an antitoxin.

W. F. Harvey.

REVIEWS AND NOTICES.

THOMPSON (W. R.) [Ph.D., D.Sc., Assistant Director, Imperial Bureau of Entomology, and Superintendent, Farnham House Laboratory]. **The Biological Control of Insect and Plant Pests. A Report on the Organisation and Progress of the Work of Farnham House Laboratory.**—1930. June. 124 pp. With 8 plates. E.M.B.29. London: H.M.S.O. [1s.]

Farnham House in Buckinghamshire with its laboratories, insect-houses and other equipment, and its 6½ acres of plantation and tillage, was founded in 1927 by the Imperial Bureau of Entomology for the experimental study of the insect-pests of crops, orchards, plantations, forests, and even of certain livestock, and of the parasites and other foes that attack and keep such insect-pests in check. As a cognate study the insects that ravage and check the spread of "weeds" that make vain the labours of the husbandman are also included.

These studies, as pursued at Farnham House, have two aspects. On the one hand, the life-histories of the individual insect-pests and of their respective parasites and natural opponents have to be accurately traced step by step (in all their stages) by observation in the field and experiment in the laboratory and insect house. On the other hand, when the vital intercurrents between a pest and its parasites (and other foes) have become known, the problems of "domesticating" the chosen parasite—that is to say of collecting it and of breeding it on a large scale for transport perhaps to distant parts of the world where it is to be colonized and brought into the service of the farmer and planter—have to be very carefully thought out. How difficult the first of these studies is can only be realized by a careful perusal of the third chapter, on the *Struggle for Existence*, in DARWIN'S *Origin of Species*; and how difficult and ingenious the processes of collecting and of breeding and shipping the parasites and providing a hospitable reception for them in a new home may be, is explained in the present volume. There are snares in these intricate studies at the very outset; for in collecting the supposed parasites of a particular noxious insect, some of them may prove to be not parasites of that insect at all, but parasites of that insect's parasites—may be the unsuspected allies of the insect-pest, not the foes that are *the* object of our desire.

Taking the insect-pests of agriculture as pests, without any close inquiry into history, all we need to know is that in the course of world trade they may be carried, unwittingly, from one country to another and from continent to continent by man, and that when an insect-pest reaches some new country, where it is not troubled by the parasites and foes that keep it in check in its native home, it is likely to establish itself and to multiply and spread until it becomes a serious and costly menace. Thus "of the 183 worst insect-pests existing in North America almost half have been intr-o duced from foreign countries," and among them "the European Corn-borer, which reached America about 15 years ago, has done so much damage that . . . in 1927 the sum of two million pounds was expended to arrest its spread." A similar story is told of the Hessian Fly, the Gipsy Moth, the Oriental Peach Moth, the Japanese Beetle, and the Mediterranean Fruit Fly. Although periodic fumigation and spraying may mitigate this havoc, such methods are recurrently expensive and may even be risky to man himself—as when arsenic is too freely used to nip the Codling Moth; and although legal enactments against noxious insects may have replaced the priestly interdicts of olden times, even the decrees of the law may be overlooked—since "several of the most injurious insects existing in the

United States were introduced in recent years in spite of the inspection services."

Fumigation and poison-sprays will always retain a place as temporary and seasonal palliatives, but for abiding defence against the settlement of immigrant insect-pests the modern policy is to bring their native foes—particularly their specific parasites—face to face with them ; and these foes may have to be discovered and selected, and may have to be bred and be brought from afar in big battalions, and at first they may want some nursing before they settle to work in fresh woods and pastures new. All this organized work and its basal principles and methods, is very lucidly set forth in the present volume. The standpoint, it is true, is that of the husbandman and planter, but to the appreciative medical officer it demonstrates that the biological control of creatures inimical to man and his works is not a careless game of chance, but is a thorny task needing some attention to the principles of biology, much forethought, and a skilful and ever ready technique—is, in short, a scientific industry.

A. Alcock.

GREENWAY (Diego Francisco) [Jefe del laboratorio de Parasitología de la Facultad de Medicina de Buenos Aires]. **Zooparasitos y zooparasitosis humanas.** [Animal Parasites and Human Infection.] 2a Edicion.—481 pp. With 212 text figs., 62 figs. on 20 plates (2 coloured) & 2 diagrams. 1929. Buenos Aires : "El Ateneo," Librería Científica y Literaria. Florida 371—Cordoba 2099.

This is the second edition of Dr. Greenway's book, but contains no indication as to the length of time which has elapsed since the first. The author in his preface disarms criticism by stating twice in a page that he makes no pretence that the book will fill a vacuum ; there is no need for him to insist on this for if there is no room for it in the first instance it will assuredly make a place for itself. The intention as stated is " to present in concise form and as graphically as possible what it is necessary for the beginner to learn, without uselessly burdening his memory," in other words, an accurate and not too detailed a text-book. After a brief sketch of the history of parasitology, a short chapter is given on methods of examination. The various helminths are then dealt with seriatim, giving the description, the life-history, mode of infection, diagnosis, pathogenic action and treatment where applicable in each case ; these are followed by descriptions of arthropods and protozoa. The graphic representations, most of them original, of the mode of infection of man and the life histories of the worms impress the chief facts on the mind of the student at a glance. Instructive tables are presented giving the localization (of protozoa, for example), the disease produced, the evolution of the parasite and the way by which man becomes infected. We note that *Ascaris lumbricoides* and Belascaris are both described, but no mention is made of Physaloptera, a worm not infrequently but erroneously regarded as Ascaris. Also, for making a faeces culture the old and messy procedure with animal charcoal is mentioned, but no reference to the better and cleaner Petri dish and blotting paper method. *Dracunculus medinensis* is said to pour out her embryos through the mouth. *Leptospira icterogenes* and *L. icterhaemorrhagiae* are described separately and different measurements are given for them, nevertheless on the succeeding page is the statement that " the spirochaetes discovered by Noguchi are identical with Leptospira icterohaemorrhagiae." Lastly, the organism of ratbite fever is designated in more than one place *Spirella morsus muris*. As a whole, however, the information is accurate and the facts tersely expressed ; the book is well produced, the illustrations and schematic representations remarkably clear, the type and paper good and misprints

very few. The author is to be congratulated on the way in which he has fulfilled his task of writing a concise introduction to the larger and deeper works on human parasitology.

H. H. S.

GIORDANO (Mario) [Maggiore Medico della R. Marina, Specialista in Patologia coloniale]. **Medicina ed Igiene Coloniale. Ad Uso degli Infermieri, Militari di Sanità, Missionari, ecc.** [Medicine and Tropical Hygiene.]—pp. xiv+495. With 130 figs. & 1 folding map. 1930. Milan: Ulrico Hoepli, Editore Libraio della Real Casa. [Lire 22.50.]

This manual (a handy volume, which can be carried in the pocket) more than fulfils the ends in view as stated in the preface, but at the same time it is not easy either to assess its value or to state what niche it can profitably occupy. The book is intended to give a simple and clear account of information useful for nurses, missionaries, navigators and travellers generally in the Colonies, and a wide field is covered. The first chapter of 28 pages, 6 of which are wholly taken up by illustrations, gives an account of the anatomy and physiology of the human body. Next follows one of 15 pages on climate, clothing, food, exercise, and general hygiene, including ethnology. The third and longest chapter gives brief accounts of infective and contagious diseases, followed by others caused by worms and by arthropods. Each is considered under the heads of definition, symptoms, treatment and prophylaxis. The deficiency diseases are dealt with in ten pages which include also a general account of vitamins. The remaining chapters deal with first aid and accidents, disinfection, laboratory examinations and international legislation.

The work, from its nature, cannot do more than skim over the surface of such a large number of subjects, but it is interestingly written, copiously and well illustrated, well printed and in a handy form. For nurses and those who can fill in the gaps by questioning a medical man, the book would be of considerable use, but we doubt whether the owner-navigator would spend time in mastering chemical urinalysis or the staining of blood smears and sputum and whether the knowledge when attained would convey to his mind anything which he could usefully apply. However, if a little knowledge is a danger, it is perhaps better to err on the side of excess of the former with the hopes of diminishing the latter.

H. H. S.

DE CASTRO (A.). **Die speziellen Krankheiten der warmen Länder und der Tropen. Kleines Handwörterbuch.** [Diseases of Warm Climates.] —87 pp. 1930. Leipzig: Johann Ambrosius Barth. [Rm. 4.80.]

The author does not claim any originality in this work, nor does he intend that it shall replace the well-known text books on diseases of the tropics. His aim is to provide a small compendium for the information of the general practitioner. The arrangement is alphabetical and each disease is dealt with under the headings of definition, aetiology, course, pathological anatomy, prognosis, diagnosis, treatment and prophylaxis. The weakest section in most cases is that of diagnosis which is often expressed in a word or two, such as "by microscopical examination." To compress the essentials of the diseases of warm climates into the small space of 87 pages must have been no light task, and it would be easy to pick holes in the work, but, to mention the good points, it may be said that with a few exceptions (yellow fever is one, and no mention is made of *T. rhodesiense* and the results of infection by it) the information is correct and fairly up-to-date, very succinctly expressed and the whole would form an excellent

book for rapid revision by a student on the point of presenting himself for examination, in other words a final cram-book which could be gone over in an evening.

H. H. S.

SOCIEDAD ARGENTINA DE PATOLOGIA REGIONAL DEL NORTE. **Quinta Reunión . . . celebrada en Jujuy del 7 al 10 de Octubre de 1929.** [Fifth Meeting of Pathological Society of Northern Argentine.] Vol. 1.—706 pp. With numerous illustrations. 1930. Buenos Aires: Imprenta de la Universidad.

The Pathological Society of Northern Argentine has published their first volume of papers read at the fifth meeting which took place in October, 1929. The articles collected here are divided into four groups. Some are concerned with academic research on pathological matters of a purely experimental character, others deal more with pathology in connexion with clinical medicine. In the first group are 7 papers relating to General Pathology and Experimental Medicine: in the second, 27 papers on Mycology and Bacteriology, several of which treat of blastomycotic infection of man, localized or general, and the cultural and experimental work connected therewith. The third and largest group comprises 31 papers on Dermatology and Syphilis, the most important from the view of the tropical practitioner being a series of contributions on Leprosy. These are reviewed separately in this *Bulletin*. In the final group are 4 articles on yellow fever. In all, therefore, there are 69 papers covering a wide field. Much of the matter is not actually new; in fact, in congresses such as this the end is attained if the contributors give an accurate summary of the advances made since the previous meeting, and that purpose is fulfilled here. The papers must doubtless have led to profitable discussions which naturally, though unfortunately, are not included in this publication; their inclusion would have made the volume unwieldy and thus have impaired its usefulness.

H. H. S.

ROBERTSON (O. H.) [M.D.] & CHEER (S. N.) [M. D.] [Compiled by]. **Manual for the Medical Services of the Peiping Union Medical College Hospital.** 3rd Edition Revised by the Staff of the Department of Medicine.—pp. vi+174. With 3 plates & 2 text figs. 1930. Peiping: P.U.M.C. Press. [Mex. $1.50.]

This is the third edition of a manual which appeared first in 1922. It is written primarily as a guide to the resident staff of the college, but the indications laid down would apply to any hospital of moderate size, say of 200–300 beds. The first section deals with staff organization and the relations to be maintained between members of the staff, together with notes on general hospital routine. The remaining five sections deal more directly with the patient himself. Two treat of case-taking and note-making from the clinical aspect, then follows one on laboratory studies, including blood, faeces and urine examinations, analysis of gastric contents, etc., and one on diagnostic procedures somewhat arbitrarily separated from the last. Finally, therapeutic procedures are detailed such as the performance of paracentesis abdominis (examination of the fluid removed comes in a previous section), intravenous injection of arsenicals, blood transfusion, intramuscular injection of bismuth and other drugs including antisera. Appended is a table of normal values which will be most useful to the student when interpreting results of the various tests. There are three plates depicting respectively the commoner helminth ova drawn mostly to scale, and the protozoa in the vegetative and the cystic stages.

H. H. S.

WELLCOME HISTORICAL MEDICAL MUSEUM. **Souvenir Henry Hill Hickman Centenary Exhibition 1830-1930 at the Wellcome Historical Medical Museum, 54, Wigmore Street, London, W.1.**—85 pp. With 24 illustrations. 1930. The Wellcome Foundation Ltd.

This book contains a preface by Dr. John D. COMRIE, a list of the Hickman exhibits at the Wellcome Historical Medical Museum, a foreword by Dr. Dudley Wilmot BUXTON and an account of the life and experiments of Hickman, pioneer in anaesthesia. Hickman in 1824, we are told, carried out experiments by operating painlessly on animals after the administration of carbon dioxide gas. (Humphry Davy, in 1800, had suggested nitrous oxide for this purpose). Hickman applied to the Royal Society and afterwards to Charles X of France, but no notice was taken of his claims. He died in 1830 at the age of 29. The book is well printed, contains reproductions of autograph letters and a representation of the title page of the pamphlet—" A Letter on Suspended Animation, containing Experiments showing that it may be safely employed during Operations on Animals, with the view of ascertaining its probable utility in surgical operations on the Human Subject, addressed to T. A. Knight, Esq., of Downton Castle, Herefordshire, one of the Presidents of the Royal Society."

A. G. B.